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THIRTY-FIFTH ANNUAL REPORT

ON THE

NEW YORK STATE MUSEUM OF NATURAL HISTORY.

Albany

BY THE

REGENTS OF THE UNIVERSITY

OF THE

STATE OF NEW YORK.

TRANSMITTED TO THE LEGISLATURE JANUARY 13, 1882.

ALBANY:
WEED, PARSONS AND COMPANY, PRINTERS.
1884.

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STATE OF NEW YORK.

No. 38.

IN SENATE,

JANUARY 13, 1882.

ANNUAL REPORT

OF THE REGENTS OF THE UNIVERSITY AS TRUSTEES OF THE STATE MUSEUM OF NATURAL HISTORY.

UNIVERSITY OF THE STATE OF NEW YORK,
OFFICE OF THE REGENTS, ALBANY, *January* 12, 1882.

To the Hon. GEORGE G. HOSKINS,
President of the Senate of the State of New York:

SIR — I have the honor herewith to transmit to the Legislature the Annual Report of the Regents of the University as Trustees of the State Museum of Natural History, as required by law.

Very respectfully your obedient servant,
H. R. PIERSON,
Chancellor.

REGENTS OF THE UNIVERSITY.

[EX-OFFICIO TRUSTEES OF THE STATE MUSEUM OF NATURAL HISTORY.]

HENRY R. PIERSON, LL. D., *Chancellor.*
GEORGE W. CLINTON, LL. D., *Vice-Chancellor.*

REGENTS EX-OFFICIO.

ALONZO B. CORNELL, *Governor.*
GEORGE G. HOSKINS, *Lieutenant Governor.*
JOSEPH B. CARR, *Secretary of State.*
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MARTIN I. TOWNSEND, LL. D.,
REV. ANSON J. UPSON, D.D., LL.D
WILLIAM L. BOSTWICK,
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CHARLES E. FITCH,
REV. ORRIS H. WARREN, D. D.,
LESLIE W. RUSSELL,
WHITELAW REID,
WILLIAM H. WATSON, M. D.,
HENRY E. TURNER,

DAVID MURRAY, LL. D., *Secretary.*
DANIEL J. PRATT, PH. D., *Assistant Secretary.*

STANDING COMMITTEE OF THE REGENTS ON THE STATE MUSEUM OF NATURAL HISTORY.

MR. LEAVENWORTH,
THE GOVERNOR,
THE CHANCELLOR,
THE VICE-CHANCELLOR,
THE SUP'T OF PUBLIC INSTRUCTION,
MR. BOSTWICK,
DR. WATSON.

SCIENTIFIC STAFF.

JAMES HALL, LL. D., *Director.*
PROF. CHARLES H. PECK, *State Botanist.*
DR. D. N. DE TARR, *in charge of Zoölogical Collections.*
DR. J. W. HALL, *Osteology and Rock Sections.*
JOHN GEBHARD, *Special Assistant.*

REPORT.

To the Honorable, the Legislature of the State of New York:

The Regents of the University, as trustees of the State Museum of Natural History, respectfully submit their thirty-fifth annual report.

Owing to the want of room for the display of additional specimens, the efforts of the scientific staff have been given chiefly to the preparation and classification of the specimens already in the Museum, and less than usual to the collection of new specimens. Reference is here made to the report of the Director for detailed information as to the current work of the Museum.

The attention of the Legislature is again called to the pressing necessity for better and more commodious quarters for this great State collection. The present building has become entirely inadequate for the proper protection and display of the collections. Not an additional foot of space can be gained for the arrangement of new matter, and large accumulations of valuable material are stored in buildings at a distance from the principal office of the Museum. Moreover, the present building is not fire-proof, and the fruit of forty years of labor, and of much expenditure by the State, is liable to be swept away by fire. It was hoped that temporary space might have been obtained in some of the rooms vacated in the State Hall for some of the more valuable parts of the collections, and for such parts of the current work of the Museum as are now carried on at great disadvantage in buildings inconveniently located. A resolution for this purpose was passed by your honorable bodies at the last session; but it has not been possible as yet for the trustees to avail themselves of the relief which this would have afforded.

By a resolution of the Legislature the trustees of the Museum were authorized to distribute to institutions under the care of the Regents who should apply for them, sets of duplicate specimens, properly arranged and labeled. This work has been carried on during the year to as great an extent as the force of the Museum would permit. The design has been to furnish to each a collection of about one hundred typical specimens, representing the most important species. It has also seemed desirable to furnish these collections only to such institutions as give promise of making a profitable use of them. It has been usual therefore to require of the recipients that a return of local specimens collected by themselves be made to the Museum. The following institutions have been supplied with collections of the kind indicated, and five additional sets have been prepared for distribution:

Warsaw Union School, Warsaw, Wyoming county.
Schoharie Academy, Schoharie, Schoharie county.

Skaneateles Library Association, Skaneateles, Onondaga county.
Phelps Union and Classical School, Phelps, Ontario county.
Seymour Smith Institute, Pine Plains, Dutchess county.
Albion Union School, Albion, Orleans county.
Westfield Union School, Westfield, Chautauqua county.
Norwich Union School, Norwich, Chenango county.
Perry Union School, Perry, Wyoming county.
Little Falls Union School, Little Falls, Herkimer county.
Baldwinsville (Free) Academy, Baldwinsville, Onondaga county.

The scientific staff of the Museum has consisted during the year of James Hall, LL. D., Director; Dr. D. N. De Tarr, Assistant in charge of the Zoölogical Collections; Dr. J. W. Hall, Assistant in charge of the collections in Osteology and Rock Sections, and John Gebhard, Special Assistant, and exhibitor of the Collections. Mr. Charles H. Peck, the State Botanist, continues his valuable labors in making collections especially in fungi, and his papers contributed to the annual reports are universally received by scientific men as standard publications. In addition to these regular assistants, Mr. C. E. Beecher and Mr. George B. Simpson have been employed as occasion required in preparing and classifying specimens.

Respectfully submitted,
H. R. PIERSON,
Chancellor.

DAVID MURRAY,
Secretary.

REPORT OF THE DIRECTOR.

To the Honorable, the Board of Regents of the University of the State of New York:

I beg leave to present herewith the Annual Report upon the State Museum of Natural History, together with the schedule of additions to the collections and library, a notice of the distribution of duplicate specimens, and several special communications.

I am able to report that the collections are all in good order and condition. There have been considerable additions to the arranged portions of the collection, and these are only restricted by the want of space for their proper disposition. I have heretofore stated the necessity which still exists, of proper working rooms and the difficulty of carrying on work in separate buildings, distant from the Museum proper. In these buildings our field collections in geology and palæontology have accumulated to the number of several hundred thousand specimens, which can be only imperfectly provided for. Of these large collections of fossils there are at least twenty-five thousand specimens which will be required in the final arrangement of the Museum, whenever adequate room shall be provided. Until this provision shall be made it is scarcely practicable to make any final distribution of the duplicate specimens, except of the more abundant species. Of these the work of description of species is so far completed, that with proper facilities, and some additional assistants competent for the work, duplicate collections to a large extent could be arranged and distributed to the institutions of learning within the State as heretofore contemplated.

The additions to the Museum collections during the year 1881 will be found recorded in detail in the lists appended.

In the botanical department there have been donated, from fourteen contributors, thirty species. One hundred and nineteen species have been added by exchange from a single contributor. Sixty-seven species of fungi, of which forty are new, have been collected by the State Botanist. To the zoölogical collections there have been added ten specimens of vertebrates representing the same number of species.

Dr. D. N. De Tarr, Mr. C. E. Beecher and Mr. George B. Simpson have contributed collections of the Unionidæ and other fresh-water shells, of which lists will be appended.

To the collections in mineralogy, geology and palæontology, there have been added by donation and exchange, six hundred and twelve specimens, and by the purchase of special collections from the Utica slate, three hundred and twenty specimens.

To the library there have been added twenty-two bound volumes and forty-four pamphlets.

CURRENT WORK OF THE MUSEUM.

In the BOTANICAL DEPARTMENT, the accompanying report of the Botanist, Mr. Charles H. Peck, will give an account of the progress of his work in the study of the fungi. The additions in this class from his own collecting are noted above.

A collection of the fungi has been classified and arranged in a large case upon the second floor of the Museum. The number of species amounts to sixty-three, of which three are of the genus GEASTER, three of BOVISTA, three of SCLERODERMA, fifteen of LYCOPERDON, and thirty-seven of POLYPORUS. In order to exhibit the different forms and varieties these are distributed in one hundred and twenty-three trays.

In the ZOÖLOGICAL COLLECTIONS, Dr. De Tarr, the assistant in this department, has added a collection of fresh-water shells made in the vicinity of Albany. The collection in ornithology has been partially rearranged, and a list of the species as known in the modern nomenclature of this class has been prepared. Some progress has been made in collecting information regarding the geographical distribution of the birds within the limits of the State of New York. Dr. De Tarr has also communicated a paper on the species of rhizopoda found in the vicinity of Albany.

The collection of Unionidæ, with sections of the shells and illustrations of anatomical structure, mentioned in my report of last year as being prepared by Mr. Simpson, is now in progress of arrangement and will soon be placed on exhibition in cases, recently provided for this and other collections, and arranged within the area formerly used as a working room upon the second floor of the Museum.

The collection of fresh-water and land shells prepared by Mr. C. E. Beecher will be placed on exhibition in the same area.*

The bones of the whale, RORQUALIS BOREALIS, purchased in 1880, were sent to Prof. H. A. Ward for preparation, and the maceration is reported as so far progressed that the skeleton will be ready for mounting some time during the coming summer.

In the GEOLOGICAL DEPARTMENT, since the completion of the descriptions of the Lamellibranchiata, considerable progress has been made in the selection, arrangement and labeling of these fossils, of which the Museum possesses large collections. Great delay has occurred in the publication of these descriptions, owing to the nonprinting of the three preceding Museum reports. The descriptions of these fossils, with some additional material, will be again communicated with the present report, and we may expect their publication during the present year.

Considerable progress has been made in the selection, cleaning and determination of the bryozoans of the Hamilton Group by Mr. Geo. B. Simpson, who has charge of these collections.*

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*The new cases provided for this area, with some others arranged upon the same, will give us nearly two hundred and fifty feet additional case room under glass.

The work of cutting and preparing sections of fossils, and of cutting, polishing and shaping specimens for the Museum collections, has been steadily continued during the year, with the exception of some interruption arising from the preparation for, and the arrangement of new cases for the reception of collections already mentioned. We have heretofore had no means of placing on exhibition any of these cuttings of fossils; but in order to give to amateurs and to visitors at the Museum some idea of the nature of this work, a glass case will be placed in one of the window recesses of the first floor, which will give room for the exhibition of about sixty specimens of these translucent sections.

The Museum now possesses a much larger collection of these sections than any other in the country, and its value in the study of the minute structure of these fossil organisms cannot be overestimated.

During the past year many boxes belonging to the Museum collections made in former years have been unpacked, the specimens cleaned, ticketed, classified, and incorporated in the general collections. Among these were twenty boxes of Chemung fossils, collected by Mr. Sherwood, in the southern counties of New York and in Tioga county, Pennsylvania. Also two barrels and several boxes of Niagara fossils, sponges, and other fossils from Hamilton, Ontario, in part collected by Mr. Walcott, in 1878; and increased by a valuable donation, including several species of DICTYONEMA and other fossils from the late William Waddell, Esq., of Hamilton. The collection made by Dr. J. W. Hall from the limestones of Lake Champlain and from the Trenton limestone of Herkimer and Oneida counties, amounting to fifty-six boxes, have also been unpacked and the specimens ticketed and recorded. A large part of these, after selections for the Museum, will serve to render more complete the series of duplicate collections from the lower formations, of which the Museum has heretofore possessed very little material. For the present time the collection has been repacked in boxes for want of drawers for its systematic arrangement.

DISTRIBUTION OF DUPLICATE COLLECTIONS.

Collections of fossils from the duplicates of the Museum collections have been furnished to the Skaneateles Library Association, the Warsaw Union School, and smaller collections sent to other educational institutions.

Ten collections, representing in each one hundred and eight species characteristic of the New York formations, have been prepared and are ready for distribution.

The number of applications for these collections is increasing with each successive year, and it is a part of the plan of the Museum to disseminate a knowledge of its labors through these collections, and otherwise as widely as possible among the educators of the State. The frequent call for collections, and for information from all parts of the

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*The descriptions of the bryozoans of the Upper Helderberg and Hamilton Groups, communicated with the report of 1879, have not yet been printed, and in order to save the priority of work done on these fossils, I communicated an abstract of the paper to the Albany Institute in March, 1881.

State, shows the increasing interest in the subjects, and the importance of these small representative collections, and their value in the estimation of the teachers of science.

With the present organization of the Museum staff this work of selecting, arranging and labeling is done under many disadvantages and bears very heavily upon the Curator and assistants.

ADDITIONS TO THE ARRANGED COLLECTIONS.

A collection of the casts of bones of the ODONTORNITHES, presented by Prof. O. C. Marsh (of which a list is appended), have been arranged in a case upon the second floor of the Museum.

The specimens donated by the Rev. W. H. Dean, and those purchased of Charles H. Haskell, from the Utica State, have been carefully studied and a series placed in the table cases of the palæontological series upon the first floor of the Museum. This series represents the development of *Triarthrus Becki*. A more recent purchase made from Mr. Haskell will enable us to complete the collection in some other groups, and notably in the Graptolitidæ and Mollusca — the whole forming a very valuable and complete representation of the fauna of this epoch.

Two remarkable specimens of Endoceras from the Trenton limestone from former collections have been added to the arranged collections of the Museum.

About one hundred and fifty specimens of the fossils of the Black River limestone; the gasteropoda of the corniferous limestone, and some large and fine specimens of *Favositers Helderbergiæ* have been selected for the arranged collections and packed in boxes properly marked, awaiting cases for their arrangement in the Museum. About thirty-five large slabs of the corniferous limestone with Eridophyllum, Heliophyllum, Zaphrentis, etc., have been temporarily arranged on shelves in the entrance hall of the Museum.

The statements above do not, however, by any means express the real amount of work done in the geological department, which in amount of interesting and valuable material for scientific study far exceeds all the other collections of the Museum. For its proper study, disposition and arrangement, more assistance is absolutely necessary, and if we are required to provide duplicate collections for the schools and colleges, it cannot be done with the present force of the Museum, unless we relinquish all original investigation.

In conclusion I may say, that were there appropriate space and proper cases for the placing of collections I am prepared to add to the palæontological department a much greater amount of material than has been added to the arranged collections during the past fifteen years.

MUSEUM PUBLICATIONS.

As I stated in the last report, nothing has yet been done to forward the publication of the Museum reports 32, 33 and 34, which now remain in the hands of the State printer. These reports with their special papers form the medium of communication between the Museum and the scientific public, and are the only means of presenting to the world evidence of work done in the several departments of science. Already we have discovered that, of the new species of fungi, descriptions of which were presented with the thirty-third report at the close of 1879, several have, in the meantime, been elsewhere described, and the same is true of some of those communicated with the thirty-fourth report.

In the thirty-third report the Curator communicated descriptions of numerous species of fossil Bryozoans of the Upper Helderberg and Hamilton Groups. The delay in publication threatened to deprive the Museum of the credit of prior publication, and an abstract of the paper has been published in the Transactions of the Albany Institute.

We have now, however, every reason to believe that the present report will have speedy publication, and that we may be able to remedy in some degree the unfortunate delay in the publication of previous reports of the Museum.

Respectfully, your obedient servant,

JAMES HALL,

Curator of the State Museum of Natural History.

December, 1881.

ADDITIONS TO THE STATE MUSEUM DURING THE YEAR 1881.

APPENDIX A.

I. BOTANICAL.

Received from Mrs. S. M. Rust, Syracuse, N. Y., specimens of three species of flowering plants.

From Mary E. Banning, Baltimore, Md., a specimen of *Pachyma Cocos*, Fr.

From Lizzie G. Barnett, Cannonsburg, Pennsylvania, specimens of *Secotium Warnei*, Pk.

From Eloise Butler, Minneapolis, Minn., specimens of *Secotium Warnei*, Pk.

From W. R. Gerard, New York city, N. Y., specimens of *Æcidium Rusbyi*, Ger., and *Polyporus arcularius*, Fr.

From J. B. Ellis, Newfield, N. J., specimens of five species of fungi.

From C. J. Sprague, Boston, Mass., specimens of *Lecidea vescicularis*, Hoffm., and *Biatora globifera*, Ach.

From S. H. Wright, M. D., Penn Yan, N. Y., specimens of six species of European fungi.

From E. C. Howe, M. D., Yonkers, N. Y., specimens of two grasses and one sedge, one of the former being new to the herbarium.

From M. F. Merchant, M. D., Moravia, N. Y., specimens of *Mitchella repens*, L., with white berries.

From H. W. Barnum, Valley Falls, N. Y., a specimen of *Trillium grandiflorum*, Salisb.

From Prof. C. E. Bessey, Ames, Iowa, specimens of *Secotium Warnei*, Pk.

From C. W. Irish, Iowa City, Iowa, specimens of *Polyporus fraxinophilus*, Pk., and *Trametes Peckii*, Kalchb.

From I. Cowles, Flushing, N. Y., a specimen of *Opuntia Rafinesquii*, Engelm.

From J. L. Bennett, Providence, R. I., specimens of one hundred and nineteen species of Carex. These were contributed in pursuance of an exchange commenced with the late Mr. S. T. Olney.

By collection of the Botanist sixty-seven species of fungi, of which forty are regarded as new species.

II. ZOÖLOGICAL.

Alcoholic specimen of the Blind Proteus (*Proteus anguinis*). From Mrs. H. Townsend, Albany.

Rattles of Colorado rattlesnake (*Crotalophorus*). From Rev. H. C. Stanley, Albany.

One specimen of Shore crab (*Sesarma cinerea*), S. W. shore of Staten Island. From Wm. T. Davis, Staten Island, N. Y.

Jaws and Tail of Whip Ray, East coast, Florida. From Douglass Corning, Troy, N. Y.

Very large hen's egg containing a smaller perfect egg. From David Westfall, West Sand Lake, N. Y.

One great blue heron (Ardea herodias, L.) From L. Schenck, Albany.

One very large Canada porcupine (Erethizon dorsatus, L.), taken two miles south of Albany. From W. F. Bennett, Albany.

By Purchase.

One American bittern (Botaurus lentiginosus, Mont.)

By Collection.

One Lora rail (Porzana carolina, L.).

A series of the following fresh-water shells has been collected in the immediate vicinity of Albany by Dr. De Tarr.

Unionidæ.

Unio complanatus, Sol.
“ cariosus, Say.
“ ochraceus, Say.
“ radiatus, Lam.
“ nasutus, Say.
“ Tappanianus, Lea.
“ pressus, Lea.
Margaritana marginata, Say.
Margaritana rugosa, Barnes.
“ undulata, Say.
Anodonta fluviatilis, Dill.
“ implicata, Say.
“ Lewisii, Lea.
“ subcylindracea, Lea.
“ undulata, Say.

Corbiculadæ.

Sphærium simile, Say.
“ striatinum, Lam.
“ rhomboideum, Say.
“ transversum, Say.
Pisidium virginicum, Bourg.
“ sp. undt.
“ “ undt.

Strepomatidæ.

Goniobasis livescens, Menke.
Goniobasis virginicum, Gm.

Rissoidæ.

A large amount of material in various genera of this family was collected but is not yet classified.

Viviparidæ.

Melantho integra, De Kay.
“ rufus, Hald.
Lioplax subcarinata, Say.
Bythinia tentaculata, L.

Valvatidæ.

Valvata tricarinata, Say.

Limnæidæ.

Limnæa elodes, Say.
" catascopium, Say.
Physa ancillaria, Say.
" heterostropha, Say.
Planorbis trivolvis, Say.
" bicarinatus, Say.
" exacutus, Say.
Planorbis parvus, Say.
Segmentina armigera, Say.
Ancylus tardus, Say.
" parallelus, Hald.
" sp. indt.
" "

III. GEOLOGICAL AND PALEONTOLOGICAL.

By Donation.

Crinoid remains, Fish Creek, Oneida county, N. Y. From Rev. P. J. Loveland, Taburg, N. Y.

Nodule of Iron Pyrites. From Patrick Griffin, N. Bennington, Vt.

Bitumen (calciferous group), Saratoga Springs. From J. B. Butler, Saratoga Springs, N. Y.

Crystalized Hæmatite, Hoosic Falls, N. Y. From W. S. Snyder, Hoosic Falls, N. Y.

Granite with dendritic markings, Atlanta, Ga. From Thos. Moore, Boltonville, Ga.

Fossils from the Utica State and Hudson River groups as follows: Eighteen specimens of *Triarthrus Becki;* one specimen of *Orthoceras coralliferum;* seven specimens of *Brachiopoda;* eleven specimens of *Graptolitidæ;* three specimens of *Cyathophycus reticulatus;* one specimen of *Modiolopsis;* one specimen of *Strophomena alternata.* From Rev. W. H. Dean, Mechanicville, N. Y.

Specimen of Hamilton Group shale, arenaceous, from Madison county, containing *Rhynconella congregata,* Hall. From D. T. Bleekman, 940 Broadway, Albany.

Specimens arranged in the table cases of the Utica State showing the evelopment of *Triarthrus Becki,* Green., selected from the collections onated by Rev. W. H. Dean, of Mechanicville, N. Y., and purchased rom Charles H. Haskell, Holland Patent, Oneida county, N. Y.

TRIARTHRUS BECKI, *Green.*

Series.

Egg ?	1	specimen.
pecimens with two thoracic segments	3	"
" " three " "	5	"
" " four " "	4	"
" " five " "	6	"
" " six " "	4	"
" " seven " "	4	"

Specimens	with	eight	thoracic	segments	3	specimens.
"	"	nine	"	"	4	"
"	"	ten	"	"	5	"
"	"	eleven	"	"	4	"
"	"	twelve	"	"	2	"
"	"	thirteen	"	"	1	"
"	"	fourteen	"	"	1	"
"	"	fifteen	"	"	2	"

Three slabs with numerous examples of young in different stages of development.

One specimen preserving the *hypostoma*, attached to the glabella.

One specimen with *Discophycus typicalis*, Walcott.

One specimen *Calymene callicephala*, Spraker's Basin, N. Y.

ADDITIONS TO HISTORICAL DEPARTMENT.

One Confederate Lance (captured at Richmond, Va., 1865), with photograph of different styles of same. Presented by Captain William McK. Heath, 712 Market street, Philadelphia, Pa.

ADDITIONS TO THE LIBRARY OF THE STATE MUSEUM DURING THE YEAR 1881.

By Donation.

Tavole wer una "Anatonia delle Piante Aquatiche," di F. Parlatore, Firenze, 1881. Roy. 8vo. *Paper.*

Il. Primo anno della clinica Ostetrica diretta dal Prof. C. V. Ballochi, nella nuova maternita di Firenze. Rendiconto dell Dott. E. Grassi, Firenze, 1880. Roy. 8 vo. *Paper.*

Dell Processo Morbosa dell Colera Asiatico memoria dell Dott. F. Pacini, Firenze, 1880. Roy. 8vo. *Paper.* From the Royal Institute of Florence.

Archives du Musée Teyler, Vol. IV, Fasc., 2, 3, 4 ; Vol. V, pt. I ; Serie II, pt. 1. Paris, 1878–'81. Roy. 8vo. *Paper.* From the Museum.

The Journal of the Cincinnati Soc. Nat. Hist., Vol. IV. Cincinnati, 1881. From the Society, in exchange.

Annual report and statistics of the Meteorology of the city of Oakland, Cal., for the year 1879. By J. B. Trembly, M. D. Same for 1880. Oakland, 1880–'81. 8vo. *Pamph.* From the author.

List of the Orthoptera collected by Dr. A. S. Packard, Jr., in the Western U. S. in the summer of 1877. By S. H. Scudder. (Extracted from Second Rept. U. S. Entomological Commission.) Washington, 1880. 8vo. *Pamph.*

The Tertiary Lake Basin of Florissant, Colorado. By S. H. Scudder, (Extracted from Vol. VI, pt. 2. Bull. U. S. Geog. and Geol. Sur. Ter.) Washington, 1881. 8vo. *Pamph.* From the author.

Bulletin of the American Geographical Society. 1879, No. 6. 1880, Nos. 1, 2, 3, 4, 5, 6. New York, 1880–'81. 8vo. *Pamphs.* From the Society.

Journal of the Royal Geological Soc. of Ireland. Vol. XV, pt. III. Dublin, 1880. 8vo. *Pamph.* From the Society.

Proceedings of the Literary and Philosophical Society of Liverpool. Vols. XXXIII, XXXIV. Liverpool, 1879–'80. 8vo. *Cloth.* From the Society.

Bulletin de la Société Imperiale des Naturalistes de Moscow. 1879, Nos. 2, 3, 4; 1880, Nos. 1, 2, 3. Moscow, 1880–81. 8vo. *Paper.* From the Society.

Science Observer. Vol. III, Nos. 6, 7, 8, 9, 10. Boston, 1881. 8vo. *Pamph.* From the Boston Scientific Society.

Smithsonian Contributions to Knowledge. Vol. XXIII. 4to. *Cloth.* Washington, 1881.

Smithsonian Miscellaneous Collections. Vols. XVIII, XIX, XX, XXI. 8vo. *Paper.* Washington. From the Smithsonian Institution.

Bureau of Education:

Circulars of Information, 1880, Nos. 6, 7. 8vo. *Pamph.*
" " " 1881, " 1, " "
Library Aids, four copies. 8vo. *Pamph.*
Comparative Statistics of Elementary Education. 4to. *Table.*
Report of the Commissioner of Education for the year 1878. Washington, 1880. 8vo. *Cloth.* From the Bureau.

Bull. U. S. Geological and Geographical Survey of the Territories. Vol. V, No. 4; Vol. VI, No. 1. Washington, 1881. 8vo. *Paper.* From the Department of the Interior.

Reports upon the condition of Crops, Nos. 37, 38. 8vo. *Pamph.* Report of the Commissioners of Agriculture, 1879. Washington, 1880. *Cloth,* 8vo. Contagious Diseases of Domestic Animals (special report 34). Washington, 1880–81. 8vo. *Cloth.* From the Department of Agriculture.

Sitzungsberichte der Naturwissenschaftlichen Geselleschaft, Isis in Dresden. Jahrang, 1880. Januar bis Juli, und Juli bis December. Dresden, 1881. 8vo. *Pamph.* From the Society.

Anales des Museo Nacional de México. Tomo, 11. Ent. 4ª. Mexico, 1880. Roy. 8vo. *Pamph.*

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CURRENT WORK OF THE MUSEUM.

APPENDIX B.

[Appendix A of the Thirty-fourth Report, 1880.]

ISTRIBUTION OF DUPLICATE FOSSILS AND MINERALS.

CURRENT WORK OF THE MUSEUM.

APPENDIX A.

Distribution of Duplicate Fossils and Minerals to colleges and some ther institutions by special acts of the Legislature ; and to the Noral schools by concurrent resolutions of the Ninety-eighth Session Laws of 1875, page 821); and to academies and schools by direction f the Board of Regents of the University.

The collections, numbered in consecutive order, were distributed as ollows:

1. To the International Geological Congress at Paris in 1878, authorized by the Board of Regents.

2. *Rensselaer Polytechnic Institute, Troy.* Jan. 25, 1876.

	No. of Specimens.
umber of species of fossils, including repetitions, 196........	584
umber of species of mineral, including varieties, 105.........	157
Total number of specimens of fossils and minerals........	741

3. *Cornell University, Ithaca.* Nov. 3, 1879 ; Feb. 19, 1876.

umber of species of fossils, including repetitions, 189.... ...	548
umber of species of minerals, including varieties, 104.......	149
Total number of specimens of fossils and minerals.......	697

4. *Long Island Historical Society, Brooklyn.* Nov. 16, 1875
Feb. 26, 1876.

	No of specimen
Number of species of fossils, including repetitions, 202........	54
Number of species of minerals, including varieties, 102.......	14
	69
In addition to the above, there were sent to the Long Island Historical Society, 33 specimens........................	3
Total............	72

5. *American Museum of Natural History, New York.* April, 1876.

Number of species of fossils, including repetitions, 178.......	52
Number of species of minerals, including varieties, 89.........	14
Total number of specimens of fossils and minerals........	66

6. *Syracuse University, Syracuse,* Nov. 23, 1874; Feb. 19, 1876.

Number of species of fossils, including repetitions, 150........	43
Number of species of minerals, including varieties, 96........	14
Total number of specimens of fossils and minerals.... ...	57

In addition to the above, Mr. Hall sent from his own private collection, to the Syracuse University, a series of characteristic specimens o rocks and iron ores from the Laurentian system of New York, consisting of seventy-seven (77) specimens [all of which were numbered an marked by a special green ticket], making the total number = 577 77 = 654 specimen

7. *State Normal and Training School, Oswego,* Nov. 23, 1874; Feb. 19, 1876.

Number of species of fossils, including repetitions, 145........	42
Number of species of minerals, including varieties, 104........	15
Total number of specimens of fossils and minerals........	58

8. *State Normal School, at Albany.* Dec. 6, 1875; Feb. 19, 1876.

Number of species of fossils, including repetitions, 136........	41
Number of species of minerals, including varieties, 100.......	14
Total number of specimens of fossils and minerals.......	56

). *State Normal and Training School, at Buffalo.* Jan. 25, 1876.

	No. of specimens
umber of species of fossils, including repetitions, 136.... ...	392
umber of species of minerals, including varieties, 97........	143
Total number of specimens of fossils and minerals........	535

). *State Normal and Training School, at Geneseo.* March 27, 1876.

umber of species of fossils, including repetitions, 127........	372
umber of species of minerals, including varieties, 92........	137
Total number of specimens of fossils and minerals........	509

1. *State Normal and Training School, at Fredonia.* May 6, 1876.

umber of species of fossils, including repetitions, 124........	374
umber of species of minerals, including varieties, 90.........	137
Total number of specimens of fossils and minerals........	511

12. *Alfred University, at Alfred.* Jan. 8, 1877.

umber of species of fossils, including repetitions, 120........	368
umber of species of minerals, including varieties, 90........	138
Total number of specimens of fossils and minerals.......	506

rofessor Roland D. Irving, University of Wisconsin, in return for some portions (tooth and part of tusk) of the Cohoes Mastodon.

umber of species of fossils, 30............................	62

3. *State Normal and Training School, at Cortland.* Oct. 28, 1878.

umber of species of fossils, including repetitions, 120........	365
umber of species of minerals, including varieties, 88........	142
Total number of specimens of fossils and minerals........	507

14. Reserved for *State Normal School, Brockport.*

umber of species of fossils, including repetitions............	355
umber of species of minerals, including varieties............	140
Total number of specimens of fossils and minerals........	495

15. Reserved for *State Normal School, Potsdam.*

	No. of specimen
Number of species of fossils, including repetitions	34
Number of species of minerals, including varieties............	14
Total number of specimens of fossils and minerals........	48

16. Reserved for

Number of species of fossils, including repetitions............	33
Number of species of minerals, including varieties............	15
Total number of specimens of fossils and minerals........	48

17. *Albion Academy and Union School, Albion, N. Y.* Dec. 6, 1880.

Number of species of fossils, including repetitions	39
Number of species of minerals, including varieties...........	15
Total number of specimens of fossils and minerals........	54

18. *Westfield Academy, Westfield, Chautauqua county, N. Y.* Nov. 1880.

Number of species of fossils, including repetitions	31
Number of species of minerals, including varieties	13
Total number of specimens of fossils and minerals........	45

19. *Norwich Academy, Norwich, Chenango county, N. Y.* Dec. 6, 1880.

Number of species of fossils, including repetitions........ ...	36
Number of species of minerals, including varieties...........	13
Total number of specimens of fossils and minerals........	50

20. *Schoharie Academy, Schoharie C. H., N. Y.* Nov. 1880.

Number of species of fossils, including repetitions............	36
Number of species of minerals, including varieties............	13
Total number of specimens of fossils and minerals........	49

II.

STATEMENT OF THE DISTRIBUTION OF FOSSILS AND MINERALS FROM THE STATE MUSEUM OF NATURAL HISTORY AND FROM THE PRIVATE COLLECTION OF JAMES HALL, FROM 1866 TO 1873.

Specimens of Fossils sent to different institutions of science or learning, within the State of New York, from 1866 to 1880, by assent or direction of the Secretary of the Board of Regents, or on application from some member of the Committee on the State Museum.

1866. *Buffalo Natural History Society, through Hon. George W. Clinton.*

*Niagara Group, (Waldron)	18	species.
*Tertiary, Alabama	41	“
	59	“

The number of examples not noted, but there were at least an average of three to each species, or 177 specimens.

1868. *A collection furnished to Dr. S. B. Woolworth, for donation to some academy, name not recorded, December,* 1868.

*Niagara group (N. Y. and Ind.)	13	species.	32	specimens.
*Medina sandstone (N. Y.)	3	“	3	“
*Lower Helderberg (N. Y.)	16	“	35+	“
Oriskany (N. Y.)	1	“	2	“
Upper Helderberg (N. Y.)	8	“	14	“
Hamilton group (N. Y.)	29	“	57	“
	70	“	143	“

1869. *The Wood Library of Canandaigua.*

*Potsdam sandstone	4	species.
*Hudson river group (Ohio)	13	“
*Niagara (N. Y. and Ind.)	18	“
*Lower Helderberg (N. Y.)	15	“
Upper Helderberg (N. Y.)	5	“
Hamilton group (N. Y.)	33	“
	88	“

Number of specimens not recorded.

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* Those marked with an asterisk were from Mr. Hall's private collection.

1869, *November.* *Jamestown Academy.*

*Lower Silurian (various formations)..	21	species.	41	specimens.
*Niagara (Waldron, Ind.).	19	"	40	"
*Lower Helderberg (N. Y.)...........	13	"	25+	"
Hamilton group (N. Y.)............	23	"	34	"
Chemung........................	8	"	13	"
*Tertiary—Alabama................	18	"	39	"
Miscellaneous......................	7	"	7	"
	109	"	199	"

III.

MEMORANDUM. SPECIMENS SENT TO INSTITUTIONS AND INDIVIDUALS IN EXCHANGE, AND FOR ASSISTANCE IN MAKING COLLECTIONS FOR THE STATE MUSEUM.

Specimens sent to the *Essex Institute* of *Salem, Mass.* In exchange for recent corals for the State Museum of Natural History, 1867 :

*Niagara group (Waldron)...........................	24	species.
Corniferous (N. Y.)	7	"
Hamilton (N. Y.)................................	51	"
Chemung (Iowa)	10	"
Chemung (N. Y.)................................	9	"
	101	"

Number of specimens about 300.

Specimens sent to the *Derby Free Museum* at *Liverpool, Eng.*, in return for objects of Natural History, and in consideration of civilities extended by Capt. Sir James Anderson in the transmission of books, etc., 1867 :

*Potsdam sandstone................................	2	species.
*Trenton limestone................................	12	"
*Hudson river group............	13	"
*Medina sandstone	5	"
*Clinton	3	"
*Niagara (N. Y. and Ind.)	19	"
*Lower Helderberg................................	23	"
Oriskany	8	"
Upper Helderberg	4	"
Hamilton	29	"
*Carboniferous...................................	12	"
*Tertiary (Alabama)..............................	33	"
	164	"

Number of specimens 450 to 500.

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*Those marked with an asterisk were from Mr. Hall's private collection.

Specimens sent to Prof. S. G. Williams of Ithaca, N. Y., in return for assistance and civilities shown to collectors of fossils for the State Museum, 1866 :

*Lower Silurian	8	species.
*Niagara (N. Y. and Ind.)	22	"
*Lower Helderberg	26	"
Oriskany	5	"
Upper Helderberg	4	"
Hamilton	25	"
*Carboniferous	11	"
*Tertiary	27	"
	128	"

Number of specimens about 350.

Specimens sent to Prof. J. D. Steele of Elmira, N. Y., in return for assistance and civilities shown to collectors for the State Museum, November 21, 1866:

*Lower Silurian	7	species.
*Niagara	19	"
*Lower Helderberg	18	"
Oriskany	3	"
Upper Helderberg	2	"
Hamilton	23	"
	72	"

Number of specimens about 200.

1870. *Mrs. Willard, Female Seminary, Troy.*

*Lower Silurian (various formations)	8	species.	13	specimens.
*Niagara (N. Y. and Ind.)	26	"	50	"
*Lower Helderberg (N. Y.)	14	"	20+	"
Oriskany sandstone (N. Y.)	3	"	3	"
Schoharie grit (N. Y.)	3	"	3	"
Hamilton group (N. Y.)	33	"	51	"
*Chemung group (N. Y. and the West)	15	"	19	"
	102	"	159+	"

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*Those marked with an asterisk were from Mr. Hall's private collection.

1870, *April. Hon. Mr. Allaben of Delaware Co., N. Y. For Margaretsville, Academy.*

*Lower Silurian (various formations)......	19 species.	27 specimens.
*Niagara group (N. Y. and Ind.).........	23 “	51 “
*Lower Helderberg (N. Y.).............	14 “	32 “
Oriskany sandstone (N. Y.).............	4 “	4 “
Schoharie grit (N. Y.).................	6 “	7 “
Hamilton group (N. Y.)................	29 “	44 “
Chemung group (N. Y.)................	6 “	8 “
	101 “	173 “

1870, *December. Dr. F. B. Hough for Lowville Academy, Lowville, N. Y.*

*Niagara group (Waldron)	20 species.	48 specimens.
*Lower Helderberg....................	21 “	67 “
Oriskany sandstone....................	2 “	3 “
Schoharie grit	4 “	5 “
Marcellus shale........................	4 “	4 “
Hamilton group........................	51 “	84 “
Portage group	1 “	1 “
Chemung group	11 “	17 “
Upper Helderberg lime	5 “	17 “
*Eocene Tertiary, Alabama	24 “	48 “
	143 “	294 “

1871, *June. Fairfield Academy.*

Oriskany sandstone.....................	3 species.	4 specimens.
Upper Helderberg......................	2 “	2 “
Marcellus shale	2 “	2 “
Hamilton group........................	38 “	62 “
Tully limestone	2 “	4 “
Portage group	1 “	1 “
Chemung group........................	12 “	18 “
	60 “	93 “

1872, *June. Prof. D. S. Martin for Rutger's Female College, N.Y. City.*

Oriskany sandstone.....................	1 species.	2 specimens.
Hamilton group........................	30 “	50 “
Chemung group........................	8 “	17 “
	39 “	69 “

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* Those marked with an asterisk were from Mr. Hall's private collection.

1873, *September.* *Prof. Samuel J. Love, Jamestown Academy, Jamestown, N. Y.*

*Niagara group (Waldron)	11 species.	26 specimens.
*Lower Helderberg	8 "	29 "
Hamilton group	11 "	15 "
Chemung group	4 "	9 "
*Carboniferous	1 "	2 "
	35 "	81 "

1880, *July.* *Albert W. Morehouse, Principal of High School, Port Byron, Cayuga Co., N. Y., at his own request.*

Niagara group (Waldron, Ind.)	9 species.	17 specimens.
Lower Helderberg	6 "	15 "
Hamilton group	15 "	30 "
	30 "	62 "

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* Those marked with an asterisk were from Mr. Hall's private collection.

APPENDIX C.

List of the species in each of ten duplicate collections of fossils prepared by the New York State Museum of Natural History, by direction of the Board of Regents, for high schools and academies in the State of New York, December, 1881.

Black River Limestone.

		No. of Specimens
1	Columnaria alveolata, Lake Champlain	1

Trenton Group.

2	Chaetetes lycoperdon, Middleville, N. Y.	2
3	Calymene callicephala, " "	1
4	Asaphus platycephalus (tail), " "	1
5	Orthis testudinaria, Leyden, N. Y.	1

Hudson River Group.

6	Orthis testudinaria, Cincinnati, Ohio	1
7	Strophomena alternata, " "	1

Niagara Group.

			No. of specimens.
8	Spirifera radiata,	Waldron, Indiana	1
9	" crispa	" "	1
10	Anastrophia internascens,	Waldron, Indiana	1
11	Rhynchonella Whitei,	" "	2
12	" Stricklandi,	" "	1
13	" neglecta,	" "	2
14	" acinus,	" "	2
15	" Indianensis,	" "	2
16	Rhynchotreta cuneata,	" "	1
17	Atrypa reticularis,	" "	1
18	Meristina Maria,	" "	1
19	" nitida,	" "	1
20	Retzia evax,	" "	1

			No. of specimens.
21	Platyostoma Niagarense,	“ “	1
22	Favosites Forbesi var occidentalis,	“ “	1
23	Eucalyptocrinus cælatus,	“ “	1
24	“ crassus,	“ “	1
25	Niagara shale with Bryozoa,	“ “	1
26	Lichenalia concentrica,	“ “	1

Lower Helderberg Group.

27	Tentaculites gyracanthus,	Clarksville, N. Y.	1
28	Stromatopora,	“ “	1
29	Favosites Helderbergiæ,	Sharon, “	1
30	Zaphrentis Roemeri,	Clarksville, “	1
31	Streptelasma strictum,	“ “	1
32	Atrypa reticularis,	“ “	1
33	Pentamerus galeatus,	“ “	1
34	Orthis varica,	“ “	4
35	Spirifera perlamellosa,	“ “	1
36	“ macropleura,	“ “	1
37	Shaly limestone with Bryozoa,	“ “	1

Oriskany Sandstone.

38	Rensselæria ovoides,	Schoharie, N. Y	1
39	“ ovalis,	Walpole, Canada	1
40	Spirifera arrecta,	Schoharie, N. Y	1
41	“ arenosa,	“ “	1

Upper Helderberg Group.

42	Strophodonta perplana (Schoharie grit),	Clarksville, N. Y.	1
43	Atrypa impressa,	“ “ “ “	1
44	Heliophyllum Halli,	Leroy, N. Y	1
45	Favosites Emmonsi,	“ “	1
46	“ hemispherica,	“ “	1
47	Eridophyllum Simcoense	“ “	1

Hamilton Group.

			No. of specimens.
48	Leiorhynchus limitaris (Marcellus shale),	W. Avon, N. Y.	1
49	Spirifera mucronata,	Widder, Canada	2
50	“ granulifera,	Alexander, N. Y	1
51	“ medialis,	York, “	1
52	Cyrtina Hamiltonensis,	Widder, Canada	1
53	Orthis Vanuxemi,	Canandaigua Lake, N. Y	1
54	Ambocœlia umbonata,	Bellona, “	1
55	Pentamerella arata,	“ “	1
56	Tropidoleptus carinatus,	Canandaigua Lake, N. Y	1
57	Rhynchonella congregata,	Leonardsville, “	1
58	Atrypa reticularis,	Canandaigua Lake, “	1
59	“ aspera,	Avon, “	1

			No. of specimens.
60	Athyris spiriferoides, Hamburgh,	“	1
61	Strophodonta concava, Canandaigua Lake,	“	1
62	Chonetes scitula, Otisco Lake,	“	1
63	“ coronata, Canandaigua Lake,	“	1
64	“ deflecta, Onondaga Creek,	“	1
65	Leiorhynchus limitaris, Otisco Lake,	“	1
66	Heliophyllum Halli, West Williams, Canada		1
67	Michelina stylopora, Hamburgh, N. Y		1
68	Phacops rana (head), Bellona, “		1
69	Dalmanites Boothi (tail), Otisco Lake, “		1
70	Orthoceras crotalum, Delphi, “		1
71	Pleurotomaria sulcomarginata, Pratt's Falls, N. Y		1
72	Platyostoma lineatum, Canandaigua Lake,	“	1
73	Modiomorpha alta, Pratt's Falls,	“	1
74	“ concentrica, Pratt's Falls,	“	1
75	Grammysia lirata, “	“	1
76	Paracyclus lirata, Schoharie county,	“	1
77	Nuculites oblongata, Cayuga Lake,	“	1
78	Cypricardella (Eodon) bellastriata, “	“	1
79	Actinoptera decussata, York,	“	1
80	“ Boydi, Delphi,	“	1
81	Pterinea flabella, Pratt's Falls,	“	1
82	Leptodesma Rogersi, Norwich,	“	1
83	Styliola fissurella (Genesee slate), Alden,	“	1
84	Lunulicardium fragile, “ Bristol,	“	1

Portage Group.

85	Plumalina plumaria, Ithaca, N. Y	1
86	Amnigenia Catskillensis (Oneonta sandstone), Gilboa, N. Y.	1

Chemung Group.

87	Productella arctirostrata, Mansfield, Pa	1
88	“ lachrymosa, Mansfield, Pa	1
89	“ hirsuta, Sullivan, Tioga county, Pa	1
90	“ speciosa, Mansfield, Pa	1
91	Ambocœlia umbonata var gregaria, Corning, N. Y	1
92	Athyris angelica, Mansfield, Pa	1
93	Atrypa reticularis, Erwin Centre, N. Y	1
94	“ hystrix, Adrian, “	1
95	Rhynchonella contracta, Mansfield, Pa	1
96	Orthis impressa, “ “	1
97	Strophodonta cayuta, Lindley, N. Y	1
98	Streptorhynchus Chemungensis, Tioga, Pa	1
99	Spirifera mesacostalis, Mansfield, Pa	1
100	“ mesastrialis, Erwin Centre, N. Y	1
101	“ Verneuili, Cherry Creek, Chautauqua Co., N. Y.	1
102	“ “ Lindley, N. Y	1
103	“ Hungerfordi, Rockford, Iowa	1
104	Edmondia Philipi, Belmont, N. Y	1

		No of specimens.
105	Sanguinolites rigida, Mansfield, Pa	1
106	Grammysia elliptica, “ “	1
107	Ptychopteria Sao, Panama, N. Y.	1
108	Catskill group with fish remains, Tioga county, Pa	1
108		117

Ten collections, with 108 species and 117 specimens each; total 1,170 specimens.

These collections have been distributed according to the following list, up to date:

1. Perry Union School. I. P. Bishop, Principal. 2–24–1882. Perry, Wyoming county, N. Y.
2. Baldwinsville Academy. R. J. Round, Principal. 2–24–1882. Baldwinsville, Onondaga county, N. Y.
3. Seymour Smith Academy. 2–25–1882. Pine Plains, Dutchess county, N. Y.
4. Waterville Union School. R. G. Cutting, Principal. 3–20–1882. Waterville, Oneida county, N. Y.
5. The Dreanan Literary Institute. C. H. Verrill, Principal. 4–7–1882. Franklin, Delaware county, N. Y.
6. Phelps Union and Classical School. Hyland C. Kirk, Principal. 4–7–1882. Phelps, Ontario county, N. Y.

APPENDIX D.

CURRENT WORK OF THE MUSEUM FOR 1880.

(Appendix B of 34th Report.)

List of Species and Specimens of Cephalopoda from the Scho-
arie Grit, Upper Helderberg, Marcellus Shale, Hamilton,
ully Limestone, Genesee Slate, Portage, Chemung and
averly Groups; as arranged in the cases of the State Museum.

Note.—The numbering in the following list corresponds with the
ecific labels, and indicates the number of specimens from each
rmation. The letters denote the number and rank of specimens in
ch species. References are made to the localities and to the plate
d figure of the *Palæontology of New York*, vol. V, pt. II, when used
r illustration. The letters (T), (W), etc., show where the specimens
e to be found—whether in the table-cases, wall-cases, etc. Those
thout such designation are arranged in the drawers under the
inton and Medina series of rock-specimens. Entries marked as
eturned," refer to specimens borrowed from the cases as previously
ranged which are now returned. All others are additions to the
iginal collections.

The specimens here enumerated have been either figured in illustra-
n, or have been used in the study and comparison of species
scribed in vol. V, part II, of the *Palæontology of New York*.

SCHOHARIE GRIT.

Number	Name.		Locality.	Reference.	Remarks.
1–α	Orthroceras Pelops		Knox	Pl. 35 A, fig. 5	T.
2–β	do	do	do	Pl. 78 B, fig. 2	
3–γ	do	do	Schoharie	Pl. 35, fig. 1	T, returned.
4–δ	do	do	Clarksville	Pl. 35 A, fig. 1	T.
5–ε	do	do	Schoharie		
6–ζ	do	do	Helderberg mts	Pl. 35, figs. 2, 2a, 3	T.
7–η	do	do	do		
8–θ	do	do	Schoharie		
9–ι	do	do	do		T.
10–ϰ	do	do	Helderberg mts	Pl. 35 A, fig. 4	
11–λ	do	do	do	Pl. 35 A, fig. 6	T.
12–μ	do	do	Clarksville		
13–ν	do	do	Schoharie		
14–ξ	do	do	Clarksville		
15–ο	do	do	Schoharie		
16–π	do	do	do		
17–ρ	do	do	do		
18–ς	do	do	do		T.
19–τ	do	do	do		
20–α	Orthoceras masculum		Helderberg mts	Pl. 78 B, fig. 1	T.
21–β	do	do	Schoharie		T, returned.
22–γ	do	do	do		Returned.
23–δ	do	do	do		
24–ε	do	do	Helderberg mts		
25–ζ	do	do	do		

25′–η	Orthoceras masculum	Schoharie		
26–θ	do do	do		T.
27–ι	do do	do		
28–ϰ	do do	Clarksville		
29–α	Orthoceras Tantalus	Schoharie	Pl. 35, fig. 10	T.
30–β	do do	do	Pl. 35, figs. 8, 9	T.
31–γ	do do	Clarksville		
32–δ	do do	Schoharie		
33–ε	do do	Clarksville		
34–ζ	do do	do		
35–η	do do	do		
36–θ	do do	do	Pl. 35 A, fig. 7	
37–ι	do do	do		
38–ϰ	do do	do		
39–λ	do do	do		
40–μ	do do	do	Pl. 35 A, fig. 10	T.
41–ν	do do	do		T.
42–α	Orthoceras cingulum	Schoharie	Pl. 76, fig. 2	T.
43–β	do do	do	Pl. 76, fig. 3	
44–γ	do do	do		
45–δ	do do	do		
46–ε	do do	do		
47–ζ	do do	do		
48–η	do do	do		
49–α	Orthoceras fluctum	Clarksville	Pl. 76, figs. 4, 7	T.
50–β	do do	do	Pl. 76, figs. 5, 6	With *O. luxum* attached.
51–γ	do do	do		
52–δ	do do	Schoharie		
53–ε	do do	do		
54–α	Orthoceras luxum	do	Pl. 77, fig. 1	T.

SCHOHARIE GRIT — (*Continued*).

Number	Name.	Locality.	Reference.	Remarks.
55–β	Orthoceras luxum	Schoharie	Pl. 78, figs. 5, 6	T.
56–γ	do do	do	Pl. 77, fig. 2	T.
57–δ	do do	do	Pl. 35, fig. 4	
58–ε	do do	do	Pl. 77, fig. 3	
59–z	do do	Clarksville	Pl. 77, fig. 4	
60–η	do do	Schoharie	Pl. 77, fig. 6	
61–θ	do do	do	Pl. 77, fig. 7	
62–ι	do do	do	Pl. 77, fig. 5	
63–ϰ	do do	Clarksville	Pl. 76, fig. 1	
64–λ	do do	do	Pl. 78, fig. 7	
65–μ	do do	Schoharie	Pl. 35, fig. 5	T.
66–	do do	do	Pl. 35, fig. 6	T.
67–ξ	do do	do	Pl. 112, fig. 12	
68–ο	do do	do	Pl. 112, fig. 14	
69–π	do do	do	Pl. 112, fig. 13	T.
70–ρ	do do	do	Pl. 81, fig. 13	T.
71–ς	do do	do		W, returned.
72–τ	do do	do		Returned.
73–υ	do do	do		Returned.
74–φ	do do	do		
75–χ	do do	do	Pl. 77, fig. 8; 78 B, fig. 3.	T.
76–ψ	do do	do		T.
77–ω	do do	do		T.
78–ά	do do	do		
79–β	do do	do		

80–γ'	Orthoceras luxum	Schoharie		
81–δ'	do do	do		
82–ε'	do do	do		
83–z'	do do	do		
84–η'	do do	do		
85–θ'	do do	do		
86–ι'	do do	do		
87–κ'	do do	do		
88–λ'	do do	Clarksville	Pl. 35, fig. 7	
89–μ'	do do	do		
90–α	Orthoceras Zeus	do	Pl. 75, figs. 1, 2	T.
91–β	do do	do	Pl. 75, fig. 3	
92–α	Orthoceras tetricum	do	Pl. 80, figs. 5, 6	
93–β	do do	do	Pl. 80, fig. 2	T.
94–γ	do do	Schoharie	Pl. 80, fig. 8	T.
95–δ	do do	do	Pl. 80, fig. 9	
96–ε	do do	Clarksville	Pl. 78 B, fig. 4	
97–z	do do	Schoharie		
98–η	do do	do		
99–α	Orthoceras collatum	Clarksville	Pl. 80, figs. 3, 4	
100–β	do do	do		
101–γ	do do	do		
102–δ	do do	Schoharie		
103–α	Orthoceras procerus	do	Pl. 35, fig. 15	T, returned.
104–β	do do	Clarksville	Pl. 78 A, fig. 8	
105–γ	do do	Schoharie	Pl. 78 A, figs. 4, 5	
106–δ	do do	do		
107–ε	do do	Clarksville		
108–z	do do	do		
109–η	do do	do		

SCHOHARIE GRIT—(*Continued*).

Number	Name.	Locality.	Reference.	Remarks.
110–θ	Orthoceras procerus	Schoharie	Pl. 78 A, fig. 1; 35, fig. 16.	T.
111–ι	do do	do	Pl. 78 A, figs. 2, 3	
112–ϰ	do do	do	Pl. 79, figs. 7, 8	
113–λ	do do	Clarksville	Pl. 78 A, figs. 6, 7	
114–μ	do do	Schoharie	Pl. 79, figs. 5, 6	
115–ν	do do	do		
116–ξ	do do	do		
117–ο	do do	do		
118–α	Orthoceras oppletum	do	Pl. 81, fig. 12	T.
119–β	do do	do	Pl. 81, figs. 9, 10, 11	
120–γ	do do	do		In 3 pieces.
121–δ	do do	Albany Co	Pl. 112, fig. 11	T.
122–α	Orthoceras pervicax	Schoharie	Pl. 79, figs. 9, 10	
123–α	Orthoceras carnosum	do	Pl. 35, fig. 11	
124–α	Orthoceras vastator	do	Pl. 78, figs. 1, 2	T.
125–β	do do	do	Pl. 78, fig. 3	T.
126–γ	do do	do	Pl. 78, fig. 4	T.
127–α	Orthoceras stylus	do	Pl. 79, fig. 1; 36, fig. 2.	
128–β	do do	do	Pl. 36, fig. 3	
129–γ	do do	do		
130–δ	do do	do		
131–ε	do do	do	Pl. 79, fig. 3	
132–ζ	do do	do		
133–η	do do	do		
134–θ	do do	do		

135–α	Orthoceras varum	Schoharie	Pl. 112, figs. 5, 6	T.
136–β	do do	do	Pl. 79, fig. 2	
137–γ	do do	do	Pl. 79, fig. 4	
138–δ	do do	do		
139–ε	do do	do		
140–ζ	do do	do		
141–α	Orthoceras Creon	do	Pl. 79, figs. 14, 15	
142–α	Orthoceras pravum	do	Pl. 81, figs. 3, 4; 112, f. 16.	
143–β	do do	do	Pl. 112, fig. 15	
144–γ	do do	do	Pl. 81, figs. 2, 5; 112, f. 17.	T.
145–δ	do do	do	Pl. 35, fig. 14; 36, fig. 1.	
146–ε	do do	do		
147–ζ	do do	Clarksville	Pl. 81, fig. 1	T.
148–η	do do	Schoharie	Pl. 81, fig. 6	
149–θ	do do	do		
150–ι	do do	Clarksville		
151–κ	do do	do		
152–λ	do do	do		
153–μ	do do	do		
154–ν	do do	Schoharie		
155–ξ	do do	do		
156–ο	do do	do		
157–π	do do	do		
158–α	Orthoceras medium	do	Pl. 79, figs. 11, 12	
159–β	do do	do		
160–α	Orthoceras Thoas	Clarksville	Pl. 78 B, fig. 5	
161–β	do do	Schoharie	Pl. 41, fig. 6	T.
162–λ	do do	do	Pl. 41, fig. 3	T, returned.
163–δ	do do	do	Pl. 80, fig. 10	Cut specimen.
164–ε	do do	do	Pl. 80, fig. 11	Cut specimen, ret'd.

SCHOHARIE GRIT — (*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
165–ζ	Orthoceras Thoas	Schoharie	Pl. 41, fig. 5	
166–η	do do	do		
167–θ	do do	do	Pl. 79, fig. 13	
168–ι	do do	do		
169–κ	do do	do		
170–λ	do do	do		
171–μ	do do	do		
172–ν	do do	Clarksville		
173–ξ	do do	do		Returned.
174–ο	do do	do		
175–π	do do ?	Schoharie		
176–ρ	do do	do		Returned.
177–ς	do do	do		
178–τ	do do	do		Returned.
179–α	Orthoceras multicinctum	do	Pl. 43, fig. 1	Returned.
180–β	do do	do	Pl. 43, fig. 2	Returned.
181–γ	do do	do	Pl. 43, fig. 3	Returned.
182–α	Gomphoceras fax	do	Pl. 122, fig. 5	T.
183–α	Gomphoceras Illænus	do	Pl. 122, fig. 6	
184–α	Gomphoceras clavatum	do	Pl. 93, fig. 2	
185–β	do do	do	Pl. 93, fig. 3	
186–γ	do do	do		
187–δ	do do	do		
188–α	Gomphoceras ? cruciferum	do	Pl. 93, fig. 4	T.
189–α	Gomphoceras rude	do	Pl. 93, fig. 1	T, returned.

190–ε	Gomphoceras clavatum	Schoharie		
191–α	Gomphoceras beta	do	Pl. 46, fig. 4	T.
192–β	do do	do	Pl. 46, fig. 5	T.
193–γ	do do	do		
194–δ	do do	do		
195–ε	do do	do		
196–z	do do	do		
197–α	Gomphoceras absens	do	Pl. 46, figs. 8, 9	
198–β	do do	do		
199–γ	do do	do	Pl. 122, fig. 1	
200–δ	do do	do	Pl. 122, fig. 3	
201–ε	do do	do		
202–z	do do	do		
203–η	do do	do		
204–θ	do do	do		
205–ι	do do	do		
206–ϰ	do do	do		
207–λ	do do	do		
208–μ	do do	do		
209–ν	do do	do		
210–α	Cyrtoceras eugenium	do	Pl. 46, figs. 5, 6	T, returned.
211–β	do do	do	Pl. 46, fig. 7	T, returned.
212–γ	do do	do		T, returned.
213–δ	do do	do		
214–ε	do do	do		
215–z	do do	do	Pl. 96, fig. 1	
216–η	do do	do	Pl. 96, fig. 5	
217–θ	do do?	do	Pl. 79, fig 16	
218–ι	do do	do	Pl. 96, fig. 4	T. gutta percha cast.
219–ϰ	do do	do		T. original.

SCHOHARIE GRIT—(*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
220–λ	Cyrtoceras eugenium	Clarksville		
221–μ	do do	do		
222–ν	do do	Schoharie		
223–ξ	do do	Clarksville.		
224–ο	do do	Schoharie	Pl. 96, figs. 8, 9	
225–π	do do	do	Pl. 97, fig. 11	
226–ρ	do do	Clarksville	Pl. 96, fig. 3	
227–ς	do do	do		gutta percha cast.
228–τ	do do	Schoharie		original.
229–υ	do do	do	Pl. 96, fig. 2	T.
230–φ	do do	do	Pl. 96, fig. 11	
231–χ	do do ?	do		Gutta percha cast.
232–ψ	do do	do	Pl. 96, figs. 6, 7	
233–α	Cyrtoceras æmulum	do	Pl. 96, fig. 2	
234–β	do do	do	Pl. 97, fig. 6	
235–γ	do do	Clarksville	Pl. 97, fig. 3	
236–δ	do do	Schoharie	Pl. 97, fig. 1	
237–ε	do do	do	Pl. 97, figs. 8, 9	
238–z	do do	do	Pl. 97, figs. 4, 5	
239–α	Cyrtoceras Jason	do	Pl. 50, fig. 1	
240–β	do do	do	Pl. 50, fig. 2	T, returned.
241–γ	do do	Clarksville	Pl. 124, fig. 7	Returned.
242–δ	do do	Knox		T.
243–ε	do do	Thompson's Lake		
244–z	do do	Schoharie		

245–η	Cyrtoceras Jason	Schoharie		Returned.
246–θ	do do	do		Returned.
247–ι	do do	do		
248–α	Gyroceras spinosum	do	Pl. 48, fig. 5; 98, fig. 7.	T.
249–β	do do	do	Pl. 99, fig. 1	T. original.
250–γ	do do	do	Pl. 99, fig. 2	T. gutta percha cast.
251–δ	do do	do		T. matrix.
252–ε	do do	do	Pl. 47, fig. 8	
253–z	do do	Clarksville.	Pl. 98, figs. 1, 2	
254–η	do do	Schoharie	Pl. 48, fig. 3	Returned.
255–θ	do do	do	Pl. 48, fig. 4	Returned.
256–ι	do do	do	Pl. 48, fig. 2	Returned.
257–$\varkappa$	do do	do	Pl. 99, fig. 3	
258–λ	do do	do	Pl. 99, figs. 5, 6	
259–μ	do do	do	Pl. 99, fig. 8	Returned.
260–ν	do do	do	Pl. 99, figs. 4, 7	
261–ξ	do do	do		
262–o	do do	do	Pl. 49, fig. 1	Returned.
263–π	do do	do		Returned.
264–ρ	do do	do	Pl. 48, fig. 1	W, returned.
265–ς	do do	do		Returned.
265–τ	do do	do		Original.
267–υ	do do	do		gutta percha cast.
268–φ	do do	do		Returned.
269–χ	do do	do		
270–ψ	do do	Clarksville.		
271–ω	do do	Schoharie		
272–$\acute{\alpha}$	do do	do		
273–θ	Orthoceras cingulum	Knox		W.
274–α	Cyrtoceras morsum	Schoharie		Returned.

SCHOHARIE GRIT—(*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
275–α	Gyroceras validum	Knox	Pl. 100, fig. 1	T.
276–β	do do	Schoharie	Pl. 49, fig. 2.	
277–ν	Orthoceras luxum	do		
278–α	Trochoceras Biton	Clarksville	Pl. 111, fig. 7	
279–α	Trochoceras Clio	Schoharie	Pl. 59, fig. 9	Returned.
280–β	do do	do	Pl. 59, fig. 1	Returned.
281–γ	do do	do	Pl. 59, figs. 2, 3	Returned.
282–δ	do do	do	Pl. 59, fig. 4	Returned.
283–ε	do do	do		
284–z	do do	do		
285–η	do do	do		
286–θ	do do ?	Clarksville	Pl. 111, fig. 6	
287–ι	do do	do		
288–κ	do do	Schoharie		
289–κ	do do	do		
290–μ	do do	do		Returned.
291–ν	do do	do		
292–α	Trochoceras discoideum	do	Pl. 59, fig. 8	Returned.
293–β	do do	do		
294–γ	do do	do		
295–δ	do do	Clarksville		
296–α	Trochoceras eugenium	Schoharie	Pl. 59, fig. 11	Returned.
297–β	do do	do		
298–γ	do do	do		
299–δ	do do	do	Pl. 58, fig. 3	

300–ε	Trochoceras eugenium	Schoharie		Returned.
301–ζ	do do	do		
302–η	do do	do		
303–θ	do do	do		
304–ι	do do	do		
305–ϰ	do do	do		
306–α	Trochoceras Orion	Knox	Pl. 58, fig. 2	
307–β	do do	do		
308–γ	do do	do		
309–ϰ	Trochoceras eugenium	Schoharie		
310–α	Trochoceras Barrandei	do	Pl. 111, fig. 10	T.
311–β	do do	do	Pl. 111, fig. 9	
312–γ	do do	Clarksville	Pl. 111, fig. 8	
313–δ	do do	Schoharie		
314–ε	do do	do		
315–ζ	do do	do		
316–α	Trochoceras Pandion	do	Pl. 58, fig. 8	
317–β	do do	do	Pl. 58. fig. 7	
318–γ	do do	do		
319–δ	do do	do	Pl. 58, fig. 9	Returned.
320–ε	do do	do	Pl. 111, fig. 3	
321–α	Trochoceras obliquatum	do	Pl. 111, figs. 1, 2	
322–β	do do	do		
323–γ	do do	do		
324–δ	do do	Clarksville		
325–ε	do do	do		
326–α	Trochoceras expansum	Schoharie	Pl. 111, fig. 5	
327–β	do do	do		
328–γ	do do	do		
329–δ	do do	do		

SCHOHARIE GRIT — (*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
330–ε	Trochoceras expansum	Schoharie		
331–α	Gonioceras? pandum	do	Pl. 111, fig. 4	
332–β	do do	Clarksville	Pl. 117, fig. 5	
333–γ	do do	do	Pl. 117, figs. 3, 4	
334–δ	do do	Schoharie		
335–η	Orthoceras varum	do		
336–α	Orthoceras duramen	Clarksville	Pl. 117, fig. 1	

UPPER HELDERBERG LIMESTONE.

Number.	Name.	Locality.	Reference.	Remarks.
1–α	Gyroceras undulatum	Cherry Valley	Pl. 53, figs. 1, 4	T.
2–β	do do	Schoharie	Pl. 53, fig. 2	T, returned.
3–γ	do do	Clarksville		T.
4–δ	do do	Cherry Valley	Pl. 54, fig. 5	T.
5–ε	do do	do do	Pl. 53, figs. 3, 6	T.
6–ζ	do do	do do	Pl. 53, fig. 5	T.
7–η	do do	do do		W.
8–θ	do do	do do		
9–ι	do do	do do		
10–κ	do do	do do		
11–λ	do do	Richfield Springs		
12–α	Gyroceras trivolve	Schoharie		Returned.
13–β	do do	do	Pl. 52 A, figs. 1, 2, 3	T, returned.
14–γ	do do	do	Pl. 52, figs. 1, 2, 3	T, returned.
15–δ	do do	do	Pl. 52, fig. 4	T, returned.

16–ε	Gyroceras trivolve	Cherry Valley	Pl. 52 A, fig. 6	T.
17–z	do do	Richfield Springs		
18–η	do do	Schoharie		
19–θ	do do	do	Pl. 52, fig. 5	T, returned.
20–ι	do do	do		Returned.
21–ϰ	do do	do	Pl. 52 A, fig. 5	T.
22–λ	do do	do		T.
23–μ	do do	do		T.
24–ν	do do	do	Pl. 52 A, fig. 4	T.
25–ξ	do do	Babcock's Hill, Otsego Co		
26–ο	do do	do do		
27–π	do do	Falls of the Ohio river, Ky.		T.
28–ρ	do do	do do		T.
29–ς	do do	Schoharie		
30–α	Gyroceras Matheri	do	Pl. 55, figs. 3, 4	T.
31–β	do do	Clarksville	Pl. 55, fig. 5	T.
32–γ	do do	Schoharie		
33–δ	do do	Building Stone, Albany		
34–ε	do do	Schoharie		
35–α	Gyroceras Cyclops	Clarksville	Pl. 102	T.
36–β	do do	Kelly's Island, Ohio		
37–γ	do do	Schoharie		
38–δ	do do	do		(fimbria) returned.
39–ε	do do	do		(fimbria) returned.
40–α	Cyrtoceras morsum	do	Pl. 46, figs. 3, 4	T, returned.
41–α	Gyroceras laciniosum	do	Pl. 52 A. fig. 8	T.
42–α	Gyroceras Nereus	Cherry Valley	Pl. 124, fig. 4	T.
43–β	do do	Cassville		Returned.
44–γ	do do	Waterloo		
45–α	Gyroceras paucinodum	Cherry Valley	Pl. 54, figs. 1–4	T.

UPPER HELDERBERG LIMESTONE — (*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
46–β	Gyroceras paucinodum	Schoharie		
47–γ	do do	do		
48–α	Gomphoceras eximium	do		Returned.
49–α	Gomphoceras absens	Clarence Hollow		T, returned.
50–β	do do	do do		T, returned.
51–γ	do do	do do		T, returned.
52–α	Cyrtoceras metula	Littleville, Genesee Co	Pl. 114, fig. 11	T.
53–α	Orthoceras inoptatum	Clarence Hollow	Pl. 113, figs. 9, 10	T.
54–α	Cyrtoceras citum	Schoharie	Pl. 51, fig. 3	
55–β	do do	do	Pl. 51, figs. 1, 2	Returned.
56–γ	do do	do		
57–δ	do do ?	Falkirk	Pl. 124, fig. 2	
58–ε	do do	Leroy	Pl. 124, fig. 1	
59–ζ	do do	do		
60–η	do do	do		
61–θ	do do	do		
62–ι	do do	do		
63–δ	Gyroceras paucinodum	Cobleskill		
64–μ	Gyroceras undulatum	Clarksville		
65–α	Orthoceras Thoas	Clarence Hollow	Pl. 41, fig. 8	
66–β	do do	Caledonia	Pl. 112, fig. 7	
67–γ	do do	Schoharie	Pl. 41, fig. 1	Returned.
68–δ	do do	do	Pl. 41, fig. 2	Returned.
69–ε	do do	do		
70–ζ	do do	Onondaga Valley		

71–α	Orthoceras profundum	Black Rock	Pl. 38, fig. 8	Returned.
72–α	Orthoceras molestum	Leroy		
73–α	Orthoceras creon	West Avon		
74–α	Orthoceras jaculum	——— N. Y.		
75–α	Orthoceras sceptrum	Cherry Valley	Pl. 117, fig. 2	
76–κ	Cyrtoceras citum	Cayuga, Canada West	Pl. 124, fig. 3	gutta percha cast.
77–λ	do do	do do		original.
78–α	Gomphoceras mitra	Lexington, Indiana	Pl. 119	Cast.
79–α	Gomphoceras impar	Columbus, Ohio	Pl. 121	Cast.
80–β	Gomphoceras mitra	do do	Pl. 121 A	Cast.
81–γ	do do	do do	Pl. 121 A	Cast.

MARCELLUS SHALE.

1–α	Goniatites Vanuxemi	Manlius	Pl. 69, fig. 6	T, returned.
2–β	do do	do	Pl. 69, fig. 5	T, returned.
3–γ	do do	do	Pl. 69, figs. 3, 4; 127, fig. 5.	T, returned.
4–δ	do do	Schoharie		T, returned.
5–ε	do do	do		T, returned.
6–ζ	do do	Manlius		T.
7–η	do do	Schoharie		T, returned.
8–θ	do do	do	Pl. 127, fig. 4	T, returned.
9–ι	do do	do		T, returned.
10–κ	do do	do		T, returned.
11–λ	do do	do		T.
12–μ	do do	do		T.
13–ν	do do	do		T, returned.
14–ξ	do do	Fenner	Pl. 68	T, returned.
15–ο	do do	Manlius		T, returned.
16–π	do do	do		T, returned.

MARCELLUS SHALE — (*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
17–ρ	Goniatites Vanuxemi	Manlius	Pl. 127, fig. 3	T, returned.
18–ς	do do	do		T, returned.
19–τ	do do	Schoharie		T, returned.
20–ν	do do	do		T.
21–φ	do do	Manlius		T.
22–α	Goniatites plebeiformis	Cherry Valley	Pl. 110, fig. 5	T.
23–β	do do	do do	Pl. 110, fig. 6	T.
24–γ	do do	do do		T.
25–δ	do do	do do	Pl. 110, fig. 3	T.
26–ε	do do	do do	Pl. 110, fig. 4	T.
27–ζ	do do	do do	Pl. 110, fig. 7	T. Cut specimen.
28–η	do do	do do		T.
29–θ	do do	do do		T.
30–ι	do do	do do	Pl. 110, fig. 8	
31–κ	do do	do do		
32–λ	do do	do do	Pl. 110, fig. 9	
33–μ	do do	do do		
34–ν	do do	do do		
35–ξ	do do	do do		
36–ο	do do	do do		
37–π	do do	do do		
38–ρ	do do	do do		
39–ς	do do	do do		
40–τ	do do	do do		
41–υ	do do	do do		

42–φ	Goniatites plebeiformis	Cherry Valley		
43–χ	do do	do do		
44–α	Goniatites discoideus	Manlius	Pl. 61, figs. 8, 9; 74, fig. 4.	T.
45–β	do do	do	Pl. 61, fig. 4; 74, fig. 3.	T.
46–γ	do do	do	Pl. 61, figs. 5, 6	T.
46′–δ	do do	do		T.
47–ε	do do	do		T, returned.
48–z	do do	do		T, returned.
49–η	do do	do		T, returned.
50–θ	do do	do		T, returned.
51–ι	do do	do		T.
52–ϰ	do do	do		T, returned.
53–λ	do do	do		T.
54–μ	do do	do		T.
55–ν	do do	do		T.
56–ξ	do do	Schoharie		T.
57–ο	do do	do		T.
58–π	do do	do		T.
59–α	Gyroceras transversum	Near Manlius	Pl. 56, figs. 1, 2	T.
60–β	do do	do do	Pl. 56, figs, 3, 4	T.
61–γ	do do	Fenner		Returned.
62–δ	do do	Schoharie		
63–α	Gyrtoceras alternatum	do	Pl. 46, figs. 9, 10	T.
64–β	do do	do		
65–γ	do do	Manlius		
66–α	Nautilus (Discites) Marcellensis	Near Manlius	Pl. 65, fig. 1	T.
67–β	do do do	Manlius	Pl. 109, fig. 10	T.
68–γ	do do do	Schoharie	Pl. 109, figs. 9, 12	T.
69–δ	do do do	do		T.
70–α	Gomphoceras solidum	Manlius	Pl. 93, fig. 9	T.

MARCELLUS SHALE — (*Continued*).

Number.	Names.	Locality.	Reference.	Remarks.
71–α	Nautilus liratus	Schoharie	Pl. 60, fig. 8	T, returned.
72–β	do do	do	Pl. 60, fig. 9	T, returned.
73–γ	do do	do		Gutta percha cast.
74–α	Nautilus bucinum	do	Pl. 60, figs. 1, 2, 3	T.
75–α	Gomphoceras oviforme	do	Pl. 45, figs. 2, 3	T.
76–β	do do	do	Pl. 46, figs. 6, 7	T.
77–γ	do do	do	Pl. 94, fig. 7	T, returned.
78–δ	do do	do		T, returned.
79–ε	do do	Manlius	Pl. 94, fig. 6	T.
80–ζ	do do	do		T.
81–η	do do	do		T.
82–θ	do do	do		T.
83–ι	do do	do		T.
84–α	Gomphoceras Conradi	Schoharie		T, returned.
85–α	Bactrites clavus	do	Pl. 84, fig. 15; 113, figs. 1, 5	T.
86–β	do do	do		T.
87–γ	do do	do		T.
88–δ	do do	do		T.
89–α	Orthoceras fustis	do	Pl. 83, fig. 11; 113, figs. 16, 17	T.
90–α	Orthoceras aptum	do	Pl. 38, fig. 8	T.
91–α	Orthoceras Thestor	do	Pl. 82, fig. 18	T.
92–α	Orthoceras crotalum	Leroy		T.
93–α	Orthoceras Marcellense	Falls of Oneida Creek	Pl. 38, fig. 7	T, returned.

94–β	Orthoceras Marcellense	Fenner		T, returned.
95–γ	do do	do		T.
96–δ	do do	do		T.
97–ε	do do	Manlius		
98–	do do	do	Pl. 83, fig. 6	T
99–η	do do	do		
100–θ	do do	do	Pl. 83, fig. 7	
101–ι	do do	do	Pl. 83, fig. 10	
102–ϰ	do do	do	Pl. 83, fig. 9	
103–λ	do do	do	Pl. 83, fig. 8	
104–μ	do do	do	Pl. 83, fig. 3	
105–ν	do do	do		
106–ξ	do do	do		
107–ο	do do	do		
108–π	do do	do		
109–ρ	do do	do		
110–α	Orthoceras subulatum	Leroy		
111–β	do do	do		
112–γ	do do	do		
113–δ	do do	do		
114–ε	do do	Schoharie		
115–ζ	do do	do		T.
116–η	do do	do		T.
117–α	Orthoceras sicinus	do		
118–θ	Orthoceras subulatum	do		
119–ς	Orthoceras Marcellense	Manlius		T.
120–ι	Orthoceras subulatum	Clifton Springs		

HAMILTON GROUP.

Number	Name.	Locality.	Reference.	Remarks.
1–α	Nautilus magister	Hamburg	Pl. 63, 108	T, returned.
2–β	do do	do	Pl. 107 fig. 6, 7	T.
3–γ	do do	do	Pl. 107, fig. 8	T.
4–δ	do do	do		T.
5–ε	do do	do	Pl. 107, fig. 1	
6–ζ	do do	do		T.
7–η	do do	Leonardsville		
8–α	Nautilus Oriens	Richmondville	Pl. 106, fig. 8; 126, fig. 2.	T. returned.cut specimen.
9–β	do do	do	Pl. 105, fig. 2	
10–γ	do do	do	Pl. 61, fig. 1	T, returned.
11–δ	do do	do		Returned.
12–ε	do do	do		
13–α	Goniatites discoideus	Delphi		
14–β	do do	do		
15–γ	do do	do		
16–δ	do do	do		
17–ε	do do	Pratt's Falls		
18–ζ	do do	do		
19–η	do do	do		
20–θ	do do	do		
21–ι	do do	do		T.
22–κ	do do	do		T.
23–λ	do do	do		T.
24–μ	do do	do		
25–ν	do do	do		

26–ξ	Goniatites discoideus	Norton's Ln'ding, Cayuga L.		
27–o	do do	do do do		T.
28–π	do do	do do do		
29–ρ	do do	do do do		
30–ς	do do	Fabius		
31–τ	do do	Bellona		
32–υ	do do	Earlville		
33–φ	do do	Cazenovia		
34–χ	do do	Geneseo		
35–ψ	do do	Otsego county		Simm's Coll.
36–ω	do do	Central New York		Picket Coll.
37–α′	do do	Solsville		T. 2 spec. returned.
38–α	Orthoceras exile	Cazenovia	Pl. 39, fig. 3	T.
39–β	do do	Norton's Ln'ding, Cayuga L.	Pl. 85, fig. 14	T.
40–γ	do do	do do do	Pl. 85, fig. 15	T.
41–δ	do do	do do do		T.
42–ε	do do	Delphi		
43–z	do do	do		
44–η	do do	Pratt's Falls		
45–θ	do do	do		
46–ι	do do	Bellona		
47–ϰ	do do	Norton's Landing		T.
48–λ	do do	Hamburg		T.
49–μ	do do	York		T.
50–ν	do do	Monteith's Point		
51–ξ	do do	Near Cazenovia		
52–o	do do	do do		
53–β′	Goniatites discoideus			
54–α	Orthoceras subulatum	Delphi	Pl. 84, figs. 7, 7×	T.
55–β	do do	Pratt's Falls, Onondaga Co.	Pl. 84, fig. 8	T.
56–γ	do do	do do	Pl. 84, figs. 6, 10	T.

HAMILTON GROUP — (*Continued*).

Number	Name	Locality.	Reference.	Remarks.
57–δ	Orthoceras subulatum	Pratt's Falls, Onondaga Co.	Pl. 84, fig. 2	T.
58–ε	do do	do do	Pl. 84, fig. 1	T.
59–z	do do	do do	Pl. 84, fig. 9	
60–η	do do	do do	Pl. 86, figs. 1, 2.	
61–θ	do do	do do		
62–ι	do do	do do		
63–ϰ	do do	do do		
64–λ	do do	do do	Pl. 84, fig. 4	T.
65–μ	do do	do do		
66–ν	do do	do do		
67–ξ	do do	do do		
68–ο	do do	Sherburne Creek		
69–π	do do	Norton's Landing		
70–α	Orthoceras Eriense	Lake Erie shore	Pl. 87, figs. 1, 2.	T.
71–β	do do	Otisca	Pl. 40, fig. 4	T.
72–α	Goniatites Vanuxemi, var. nodiferus.	Cherry Valley	Pl. 127, fig. 7	
73–β	do do do	do		
74–α	Orthoceras rudens	Livingston Co., N. Y	Pl. 118, fig. 1	
75–α	Orthoceras Bebryx	Cazenovia	Pl. 39, fig. 2	T.
76–β	do do	do	Pl. 38, fig. 10	T.
77–γ	do do	Skaneateles Lake.	Pl. 83, fig. 14	
78–δ	do do	York	Pl. 84, fig. 11	
79–ε	do do	Tully		
80–z	do do	Schoharie		
81–α	Orthoceras linteum	S. of Leonardsville	Pl. 87, figs. 3, 4	T.

82–α	Orthoceras sp. indet.	Ontario, Canada West	Pl. 83, fig. 13.	
83–α	Orthoceras constrictum	Hamburg		
84–β	do do	do		
85–γ	do do	Canandaigua Lake	Pl. 85, fig. 13	
86–δ	do do	do	Pl. 85, fig. 11	
87–ε	do do	Hamburg		
88–z	do do	do		
89–η	do do	do		
90–θ	do do	Otsego Co		Simms' Coll.
91–ι	do do	Bellona		
92–κ	do do	Schoharie		
93–λ	do do	Near Clarksville		
94–α	Orthoceras emaceratum	Hamburg	Pl. 39, fig. 4	T.
95–β	do do	Jaycox's Run	Pl. 85, fig. 16	
96–γ	do do	do		
97–δ	do do	do		
98–ε	do do	do		
99–α	Orthoceras aulax	Hamburg	Pl. 84, fig. 18	
100–α	Orthoceras scinctilla.	Pratt's Falls	Pl. 84, fig. 21; 113, fig. 6.	T.
101–β	do do	do	Pl. 84, figs. 19, 20.	T.
102–γ	do do	do	Pl. 113, figs. 7, 8, 9	
103–δ	do do	do	Pl. 113, figs. 10, 11, 12.	
104–ε	do do	do		
105–z	do do	do		
106–α	Orthoceras Telamon	Monteith's Point	Pl. 85, figs. 3, 4	T.
107–β	do do	do	Pl. 85, figs. 12, 13.	T.
108–γ	do do	do		
109–δ	do do	do		
110–ε	do do	do		
111–z	do do	do		
112–η	do do	do		

HAMILTON GROUP—(*Continued*).

Number.	Name.	Locality.	Reference	Remarks.
113–θ	Orthoceras Telamon.	Monteith's Point.		
114–ι	do do	do		
115–α	Orthoceras Ægea.	Geneseo.	Pl. 82, fig. 11.	T.
116–β	do do	Pratt's Falls.	Pl. 82, fig. 9.	
117–γ	do do	Geneseo.	Pl. 82, fig. 10.	
118–α	Orthoceras Œdipus.	Jaycox's Run	Pl. 82, fig. 17.	
119–β	do do	Geneseo.	Pl. 37, fig. 6.	
120–γ	do do	Darien.		
121–δ	do do	York		
122–ε	do do	do		
123–ζ	do do ?	do		
124–α	Orthoceras crotalum	Pratt's Falls.	Pl. 82, fig. 1.	T.
125–β	do do	do		T.
126–γ	do do	do	Pl. 82, fig. 5.	T.
127–δ	do do	do	Pl. 113, figs. 13, 13 *a*.	T.
128–ε	do do	do	Pl. 82, fig. 6.	T.
129–ζ	do do	do	Pl. 82, figs. 7, 8	
130–η	do do	do	Pl. 82, figs. 3, 4.	
131–θ	do do	do		
132–ι	do do	do		
133–κ	do do	do		
134–λ	do do	do		
135–μ	do do	do		
136–ν	do do	do		
137–ξ	do do	do		
138–ο	do do	do		

139–π	Orthoceras crotalum	Pratt's Falls		
140–ρ	do do	do	Pl. 42, fig. 2	
141–ς	do do	do		
142–τ	do do	Geneseo	Pl. 42, fig. 12	
143–υ	do do	Dresden		
144–φ	do do	Tully		
145–χ	do do	Delphi	Pl. 82, fig. 2	
146–ψ	do do	Bellona		
147–ω	do do	do		
148–α'	do do	Sherburne Creek		
149–β'	do do	W. shore Cayuga Lake		
150–γ'	do do	Ludlowville		
151–δ'	do do	Otisco Lake	Pl. 42, fig. 7	
152–ε'	do do	Delphi		
153–ζ'	do do	Schoharie		
154–η'	do do	Delphi		
155–θ'	do do	Schoharie	Pl. 42, fig. 6	Returned.
156–ι'	do do	Hamilton	Pl. 42, figs. 5, 11	Returned.
157–$\varkappa'$	do do	Genesee Co		Returned.
158–λ'	do do	Clarksville		
159–μ'	do do	do		
160–ν'	do do	do		
161–α	Orthoceras tersum	Pratt's Falls		T.
162–α	Orthoceras nuntium	Geneseo	Pl. 43, fig. 14	
163–β	do do	do	Pl. 43, fig. 10	
164–γ	do do	Hamburg	Pl. 43, figs. 6, 7	
165–δ	do do	do		
166–ε	do do	Monteith's Point		
167–ζ	do do	Muttonville		
168–η	do do	Pratt's Falls		
169–θ	do do	York		

HAMILTON GROUP—(*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
170–ι	Orthoceras nuntium	Bellona		
171–κ	do do	Moscow		
172–α	Orthoceras cælamen	Muttonville	Pl. 82, fig. 161	Lower portion of fig. 10, pl. 42.
173–β	do do	Pratt's Falls	Pl. 82, fig. 14	
174–γ	do do	do	Pl. 82, fig. 15	
175–δ	do do	Darien		
176–ε	do do	Bellona		
177–ζ	do do	do		
178–η	do do	Norton's Landing		
179–θ	do do	Monteith's Point		
180–α	Orthoceras lima	Schoharie		
181–α	Gomphoceras raphanus	Pratt's Falls	Pl. 94, fig. 4	T.
182–β	do do	do	Pl. 94, figs. 2, 3	T.
183–γ	do do	do	Pl. 94, fig. 10	T.
184–δ	do do	do		
185–α	Gomphoceras? planum	Borodino	Pl. 57, figs. 1, 2	
186–α	Cyrtoceras (Gomp'ras?) formosum	Penn Yan	Pl. 95, figs. 8, 9	
187–α	Gomphoceras poculum	Cazenovia	Pl. 93, figs. 7, 8	T, returned.
188–α	Gomphoceras pingue	Seneca Lake		Picket Coll.
189–α	Gomphoceras sp	Skaneateles Lake	Pl. 60, fig. 7	
190–α	Nautilus liratus, var. juvenis	Cazenovia	Pl. 56, figs. 5, 6	T, returned.
191–β	do do do	Sherburne	Pl. 57, fig. 3	Returned.
192–α	Nautilus subliratus	Earlville	Pl. 57, figs. 6, 7	
193–β	do do	do	Pl. 57, fig. 4	T.
194–γ	do do	do		
195–δ	do do	Skaneateles Lake	Pl. 57	

196–α	Nautilus bucinum	Cazenovia	Pl. 106, figs. 4, 5	Returned.
197–β	do do	do	Pl. 106, fig. 7	Cut specimen.
198–γ	do do	Solsville	Pl. 60, fig. 4; 106, fig. 6.	Returned.
199–δ	do do	Cumberland, Md.	Pl. 126, fig. 1	Plaster cast.
200–ε	do do	Pratt's Falls	Pl. 107, figs. 2, 3	
201–ζ	do do	Delphi	Pl. 109, fig. 6	
202–ε	do do	do		
203–θ	do do	Canandaigua Lake	Pl. 109, fig. 1	
204–ι	do do	Muttonville		
205–ϰ	do do	York		
206–λ	do do	Cazenovia		
207–μ	do do	Schoharie		
208–α	Nautilus acræus	Near Bridgewater	Pl. 109, figs. 3, 4, 5.	
209–α	Nautilus maximus	Solsville		W, returned.
210–β	do do	do	Plates, 63, 64	Returned.
211–γ	do do	do		Cut specimen.
212–δ	do do	Richmondville		
213–ε	do do	do		
214–ζ	do do	Borodino		
215–α	Goniatites complanatus	Eighteen-mile Creek		
216–α	Goniatites uniangularis	Moscow	Pl. 127, fig. 10	
217–α	Goniatites unilobatus	Norton's Landing	Pl. 71, figs. 15, 16; 74, fig. 5	
218–β	do do	do do		
219–γ	do do	do do		
220–β	Goniatites uniangularis	Sherburne Creek		
221–γ	do do	Norton's Landing		
222–η	Nautilus maximus	Borodino		
223–ζ	Orthoceras emaceratum	Western New York		
224–β	Goniatites uniangularis	Pratt's Falls	Pl. 127, fig. 10	
225–ρ	Orthoceras subulatum	do		
226–η	Orthoceras Œdipus	Schoharie		

TULLY LIMESTONE.

Number.	Name.	Locality.	Reference.	Remarks.
1–α	Orthoceras crotalum	Ovid		T, returned.
2–β	do do	do		T, returned.
3–γ	do do	do		T, returned.
4–α	Gomphoceras —— sp.	do		T, returned.
5–α	Goniatites discoideus	Otisco	Pl. 71, fig. 1	T, returned.
6–α	Goniatites amplexus	Lodi Landing, Seneca Lake.	Pl. 127, fig. 1	

GENESEE SLATE.

Number.	Name.	Locality.	Reference.	Remarks.
1–α	Gomphoceras manes	Alden	Pl. 123, fig. 2	

PORTAGE GROUP.

Number.	Name.	Locality.	Reference.	Remarks.
1–α	Orthoceras Thyestes	Watkins	Pl. 88, fig. 2	T.
2–α	Orthoceras Atreus	Portageville	Pl. 88, fig. 1	T, returned.
3–β	do do	do		T, returned.
4–α	Gomphoceras Ajax	Penn Yan	Pl. 94, fig. 8	T, returned.
5–α	Orthoceras pacator	Mt. Morris	Pl. 89, fig. 1	T, returned.
6–β	do do	do	Pl. 89, fig. 3	T, returned.
7–γ	do do	do	Pl. 89, fig. 4	T, returned.
8–δ	do do	Ithaca	Pl. 89, fig. 5	T.
9–ε	do do	do	Pl. 89, fig. 6	T.
10–α	Goniatites uniangularis	Mt. Morris	Pl. 72, figs. 6, 7	T.
11–β	do do	do		T.
12–α	Goniatites complanatus v. perlatus.	Homer	Pl. 70, fig. 12	T, returned.
13–β	do do	Seneca Lake		T.
14–α	Goniatites peracutus	Ithaca	Pl. 69, fig. 8; 74, fig. 13	T.

15–α	Goniatites complanatus	E. side Cayuga Lake		T.
16–α	Goniatites Patersoni	Portage Falls	Pl. 72, fig. 5	T, returned.
17–α	Goniatites sinnosus	Ithaca	Pl. 70, fig. 15; 74, fig. 11	T.
18–β	do do	Truxton	Pl. 70, fig. 14	T, returned.
19–γ	do do	Ithaca	Pl. 70, fig. 13	T, returned.
20–β	Goniatites Patersoni	Paterson's Creek	Pl. 127, fig. 9	Cast.
21–γ	Goniatites complanatus, v. perlatus	E. side Cayuga Lake		

CHEMUNG GROUP.

1–α	Gomphoceras tumidum	Ithaca	Pl. 93, fig. 6	T.
2–α	Goniatites Chemungensis	Owego	Pl. 69, fig. 9; 74, fig. 6.	T, returned.
3–α	G. Chemungensis var. equicostatus.	Central New York	Pl. 69, fig. 10	T.
4–α	Goniatites simulator	Ithaca	Pl. 69, fig. 2; 74, fig. 8.	T.
5–β	Gomphoceras tumidum	do		T.
6–γ	do do	do	Pl. 95, fig. 2	T.
7–δ	do do	do	Pl. 95, fig. 3	T.
8–α	Orthoceras palmatum	Southern New York	Pl. 90, figs. 9, 10	T.
9–α	Orthoceras Leander	S. of Ithaca	Pl. 90, fig. 7	T, returned.
10–β	do do	do	Pl. 90, fig. 6	T.
11–α	Orthoceras Demus	Ithaca	Pl. 90, fig. 5	T.
12–β	do do	Philipsburgh	Pl. 90, fig. 1	T, returned.
13–α	Orthoceras Bebryx, var. Cayuga	Cortland	Pl. 86, fig. 5	T.
14–β	do do	Ithaca	Pl. 86, fig. 3	T.
15–γ	do do	do		T.
16–δ	do do	do	Pl. 86, fig. 4	T.
17–	Orthoceras	(Poor specimen placed among dupl'cts)		Returned.
18–α	Orthoceras expositum	Canton, Bradford co., Pa.	Pl. 118, fig. 2	
19–β	do do	do		
20–γ	do do	Austinsville, Bradf'd co., Pa.		
21–δ	do do	do		

CHEMUNG GROUP — (*Continued*).

Number.	Name.	Locality.	Reference.	Remarks.
22–ε	Orthoceras expositum	Austinsville, Bradf'd co., Pa.		
23–α	Orthoceras consortale	Panama	Pl. 118, figs. 3, 4, 5	
24–β	do do	do		
25–α	Orthoceras sp.	Chenango Forks		
26–α	Gomphoceras nasutum	Belmont	Pl. 120, figs. 5, 6, 7	
27–β	do do	do		
28–γ	do do	do		
29–α	Nautilus parallelus	Salamanca?	Pl. 126, figs. 3, 4, 5	Chemung?

WAVERLY GROUP.

Number.	Name.	Locality.	Reference.	Remarks.
1–α	Gomphoceras potens	Medina, Ohio	Pl. 122, fig. 8	T.

SUMMARY.

SCHOHARIE GRIT.

336 specimens.
42 belonging to the old arrangement.
294 new to the collections.
63 now arranged in the cases.
273 wanting space.

UPPER HELDERBERG LIMESTONE.

81 specimens.
19 belonging to the old arrangement.
62 new to the collections.
30 now arranged in cases.
51 wanting space.

MARCELLUS SHALE.

120 specimens.
29 belonging to the old arrangement.
91 new to the collections.
83 now arranged in the cases.
37 wanting space.

HAMILTON GROUP.

226 specimens.
15 belonging to the old arrangement.
211 new to the collections.
50 now arranged in the cases.
176 wanting space.

TULLY LIMESTONE.

6 specimens.
5 belonging to the old arrangement.
1 new to the collections.
5 now arranged in the cases.
1 wanting space.

GENESEE SLATE.

1 specimen.

PORTAGE GROUP.

21 specimens.
10 belonging to the old arrangement.
11 new to the collections.
19 now arranged in the cases.
2 wanting space.

CHEMUNG GROUP.

29 specimens.
4 belonging to the old arrangement.
25 new to the collections.
16 now arranged in the cases.
13 wanting space.

WAVERLY GROUP.

1 specimen.

TOTALS.

821 specimens with labels for arrangement in the cases.
124 belonging to the old arrangement.
697 new to the collections.
268 now arranged in the cases.
553 wanting space.

CRINOIDEA *from the* TENTACULITE LIMESTONE, *used in illustration and description in the museum edition of the Twenty-eighth annual report, and now arranged in the table cases,* 1880.

Number.	Name.	Locality.	Reference.	Remarks.
1–α	Camarocrinus stellatus	Schoharie	Pl. 35, figs. 1, 2, 5, 6...	T.
2–β	do do	do	Pl. 35, figs. 3, 4, 7.....	T.
3–γ	do do	do	Pl. 35, fig. 8..........	T.
4–δ	do do	do	....	T, section of wall.

APPENDIX E.

(Communicated with the Thirty-third Report.)

LIST OF THE UNIONIDÆ OF THE GOULD COLLECTION.

*Serial number.	† Gould number.	Name.	Author.	No. of examp.	Locality, etc.
1	5539 5541	Triquetra corrugata	Lam	4	Brazil.
2	5542 5145	T. subviridis	Klein	3	Brazil.
2a	5540	T. elongata	Swain	1	Brazil.
5	5543	Prisodon truncatus	Schum	6	Brazil.
8	5136	Unio Cumingii	Lea	1	Northern China.
10	5135	U. Nicklinianus	Lea	1½	Mexico.
12	6501	U. Boykinianus	Lea	1	Chattahoochee River.
14	5141	U. delphinus	Gruner	2	Singapore.
15	5147 5139	U. alatus	Say	7	Western Rivers.
20	5709	U. gravidus	Lea	1	Siam.
22	5142	U. lævissemus	Lea	1	Ohio.
26	4772	U. gracilis	Barnes	3	Ohio.
27	5770	U. generosus	Gould	2	India (6 in type series).
28	3998 5166	U. pressus	Lea	6	Ohio.

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*Serial number in Lea's Synopsis of the Family Unionidæ.
†Number in the manuscript copy of the catalogue of the Gould Collection in the State Museum Library.

28a	6250	U.	Peguensis	Anth	1	East Indies ("Pegw. Anth.").
31	5132	U.	multiplicatus	Lea	3	Ohio.
34	5139	U.	undulatus	Barnes	6	Ohio.
36	6502	U.	atrocostatus	Lea	1	Alabama.
38	5144	U.	plicatus	Lesueur	5	Indiana.
39	5140	U.	infucatus	Conrad	1	Georgia.
40	3956	U.	Kleinianus	Lea	1	Georgia.
44	3934	U.	foliatus	Hild	6	Ohio.
45	5134	U.	cælatus	Conrad	4	Tennessee.
49	......	U.	dimotus	Lea	2	Ceylon.
55	4714	U.	corrugatus	Lam	2	Rivers of Bengal.
58	5713	U.	Tavoyensis	Gould	13	Tavoy, Burmah (10 in type series).
59	6252	U.	crespisulcatus	Benson	1	Pegu, Burmah.
61	....	U.	asperulus	Lea	1	Siam.
62	5141	U.	pliciferus	Lea	5	Mexico.
72	5143	U.	trapezoides	Lea	8	Washita.
76	6251	U.	ellipticus	Spix	4	Brazil.
78	5702	U.	cucumoides	Lea	2	Hunter's River, New Holland.
79	5680 5138	U.	subtentus	Say	6	Tennessee.
80	5138 5675	U.	Hembeli	Conrad	2	———?
81	......	U.	Osbeckii	Philippi	2	Fuh-Shan, China.
83	5148 5671	U.	Conradianus	Lea	2	Tennessee.
92	6410a	U.	crispatus	Gould	½	Savoy (in type series).
94	5648	U.	gratiosus	Philip	4	Deccan.
99	5194	U.	Grayii	Lea	1	China.
102	3954	U.	lachrymosus	Lea	6	Ohio.
105	3983	U.	asperrimus	Lea	3	Washita.

UNIONIDÆ OF THE GOULD COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	No. of examp.	Locality, etc.
108	3957 3964	U. fragosus	Conrad	5	Ohio River.
111	3968	U. pustulatus	Lea	6	Ohio River.
112	3986	U. Schoolcraftii	Lea	8	Michigan.
113	3992	U. apiculatus	Say	3	Lousiana.
114	3985	U. asper	Lea	6	New Orleans.
116	3963	U. stapes	Lea	1	Alabama.
118	5766	U. sparsus	Lea	1	Tennessee.
119	3957	U. metanever	Raf	6	Ohio River.
121	3958	U. intermedius	Conrad	4	Tennessee.
122	4519	U. cornutus ?	Barnes	6	Mississippi and Ohio.
123	3984	U. pustulosus	Lea	6	Tennessee and Ohio.
124	3982 3987 3991	U. sphæricus	Lea	6	Lousiana, Mississippi and Tallapoosa River. 3987 type.
125	3991 3984	U. asperatus	Lea	4	Alabama.
128	3989	U. turgidus	Lea	6	Louisiana.
129	3960	U. Cooperianus	Lea	2	Ohio.
130	3955 5761	U. verrucosus	Barnes Lea	5	Wabash River.
132	3968	U. graniferus	Lea	1	Ohio.
134	3962	U. irroratus	Lea	8	Ohio.
136	3933	U. dromas	Lea	.....	Tennessee.
139	3959	U. Æsopus	Green	4	Ohio River.

140	3961	Unio varicosus	Lea	2	Ohio River.
141	3939	U. perplexus	Lea	6	Scioto River.
142	3937	U. propinquus	Lea	4	Tennessee.
146	3942	U. tuberculatus	Barnes	5	Ohio.
148	3940	U. cylindricus	Say	5	Ohio.
149	3926 6426	U. spinosus	Lea	5	Georgia.
150	3990	U. collinus	Conrad	1	Virginia.
156	5715	U. Averyi	Lea	1	Isthmus of Darien.
160	3970	U. Estabrookianus	Lea	2	Tennessee.
167	.....	U. aratus	Lea	1½	East Indies.
177	5701	U. scamnatus	Marelet	2	Cuba.
183	3938a	U. arcæformis	Lea	6	Tennessee.
188	3981	U. triangularis	Barnes	5	Ohio.
194	3946 3977	U. elegans	Lea	6	Ohio.
195	3946	U. donaciformis	Lea	6	Ohio.
197	3945	U. heterodon	Lea	5	Massachusetts.
200	3969	U. securis	Lea	6	Ohio.
201	4794	U. abacus	Hald.	1	Tennessee.
202	3979	U. camelus	Lea	1	Ohio.
203	4017	U. ovatus	Say	4	Ohio.
205	4020	U. excavatus	Lea	2	Alabama River.
206	4765	U. perradiatus	Lea	1	Tennessee.
211	3949	U. crassidens	Lam	7	Ohio.
212	3951	U. incrassatus	Lea	2	Georgia.
215	5197	U. Forbesianus	Lea	1	Georgia.
216	4536	U. gibber	Lea	3	Tennessee.
220	3952	U. rubiginosus	Lea	7	Ohio.
229	3972 3973	U. Bigbyensis	Lea	3	Tennessee (typical form and variety).

UNIONIDÆ OF THE GOULD COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	No. of examp.	Locality, etc.
222	5742	Unio striatulus	Lea.	4	North Carolina.
235	4798	U. Clinchensis	Lea.	1	Tennessee.
235a	4798	U. Lawii	Lea.	1	Tennessee.
236	3966 3967	U. personatus	Say.	2	Ohio.
237	6246	U. Stewardsonii	Lea.	1	Tennessee (male).
239	3997	U. Sowerbyanus	Lea.	4	Tennessee (same as No. 304).
241	3950	U. trigonus	Lea.	5	Ohio, etc.
245	5647	U. Rajahensis	Lea.	1	Bengal.
246	5717	U. favidens	Benson.	4	Bengal.
252	4797	U. tumescens	Lea.	½	Tennessee.
256	5765	U. solidus	Lea.	1	Ohio.
257	3953 3976	U. obliquus	Lam.	4	Ohio.
258	3947	U. plenus	Lea.	3	Ohio.
259	3947	U. pyramidatus	Lea.	7	Ohio.
260	3971	U. Bournianus	Lea.	1	Ohio.
261	4797	U. Edgarianus	Lea.	2	Tennessee.
261c	4798	U. Andersonensis	Lea.	½	Tennessee.
264	4766 4793	U. Troostii	Lea.	3	Tennessee.
266	5170	U. lepidus	Gould.	1	Florida (in type series).
268	——	U. Pazii	Lea.	1	China.
280	4518	U. decisus	Lea.	2	Alabama.

286	3978	U.	clavus	Lam.	6	Ohio.
287	3971	U.	patulus	Lea.	7	Ohio.
290	3971	U.	Murrayensis	Lea.	1	Washita.
295	4795	U.	Ravenelianus	Lea.	3	French Broad River, N. C.
301	4029	U.	Rangianus	Lea.	9	Sciota River, Ohio.
303	3988 3999	U.	sulcatus	Lea.	3	Ohio.
304	4760	U.	Haysianus	Lea.	4	Tennessee.
305	4518	U.	ellipsis	Lea.	5	Ohio.
308	4766	U.	castaneus	Lea.	2	Alabama River.
316	5168	U.	umbrosus	Lea.	2	Medellin River, Mexico.
319	4774	U.	Lecontianus	Lea.	2	Georgia.
324	5164	U.	perdix	Lea.	2	Tennessee.
326	4026 4021	U.	occidens	Lea.	7	
328	4015	U.	dolabræformis	Lea.	4	Altamaha River, Georgia.
329	4023	U.	capax	Green.	2	Ohio.
330	5165	U.	splendidus	Lea.	4	Altamaha River, Georgia.
331	4019	U.	ochraceus	Say.	5	New England and New York.
333	5196	U.	stagnalis ?	Conr	2	Ogeechee River, Georgia.
339	4027	U.	cariosus	Say.	5	New England and New York.
347	3994	U.	multradiatus	Lea.	4	Ohio and Tennessee.
350	4016	U.	perovalis	Conr	1	Coosa River, Alabama.
351	3935 5672	U.	capsæformis	Lea.	7	Tennessee.
354	6041 3965	U.	Florentinus	Lea.	2	Tennessee (3965 female).
364	5167	U.	interruptus	Lea.	1	Tennessee.
369	5152	U.	Stonensis	Lea.	1	Tennessee.
371	5195	U.	exiguus	Lea.	3	Chattahoochee River, Georgia.
372	5768	U.	Rutersvillensis	Lea.	1	Texas.

UNIONIDÆ OF THE GOULD COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	No. of examp.	Locality, etc.
375	4764 5177	Unio spatulatus	Lea	2	Fox river, Illinois; and Michigan.
377	4022 4775	U. ligamentinus	Lam.	9	Ohio, Michigan, etc.
382	4773	U. orbiculatus	Hild	8	Ohio.
385	5162	U. Hydianus	Lea	6	Indiana.
391	5160	U. luteolus	Lam	9	Ohio and New York.
391	4025	U. luteolus var. distans	Anth.	1	Lakes of Michigan.
394	5188	U. tener	Lea	1	South Carolina.
395	5767	U. Prevostianus	Lea	1	Georgia.
399	5744	U. radiatus	Lam	1	———.
399a	5742	U. conspicuus	Lea	½	North Carolina.
404	5769	U. regularis	Lea	2	Tennessee.
410	5700	U. Medellinus	Lea	5	Medellin river, Mexico.
421	5188	U. rutilans	Lea	3	Alabama.
426	——	U. concestator	Lea	3½	Georgia.
427	6045 5191	U. lienosus	Conr.	4	Alabama.
430	5677	U. Nashvillensis	Lea	2	Cumberland river, Tennessee.
432	4778	U. umbrans	Lea	5	Alabama.
435	4782	U. obscurus	Lea	2	Tennessee.
445	5769	U. Vanuxemii	Lea	1	Tennessee.
479	——	U. contradens	Lea	1	Iowa.
486	5707	U. Bengalensis	Lea	1	Bengal (*U. verucundus* Gould, in types).

486	——	U.	caeruleus	Lea	1	Calcutta.
491	——	U.	divarius	Lea	2½	Bengal.
494	5664	U.	Batavus	Lam	4	Europe.
500	5181	U.	Buckleyi	Lea	5	Florida.
502	5190	U.	coruscus	Gould	3	Florida (in type series).
504	5187	U.	pusillus	Lea	1	Georgia.
506	5950	U.	fuscatus	Lea	4	Florida.
508	5951	U.	ocultus	Lea	6	Florida.
511	5184	U.	Cumberlandianus	Lea	5	Tennessee.
518	4771	U.	glaber	Lea	1	Tennessee.
520	4761	U.	fabalis	Lea	5	Ohio.
524	4777	U.	parvus	Barnes	6	Ohio.
533	6044 4769	U.	Haleianus	Lea	4	Louisiana.
536	4776	U.	glans	Lea	7	Indiana.
543	6040	U.	pullus	Conr	1	South Carolina.
554	5738	U.	discus	Lea	½	Tampico, Mexico.
555	5199 4763	U.	simus	Lea	4	Tennessee.
558	5656	U.	Niloticus	Caill	2	River Nile.
563	5764 3941 3936 5692	U.	brevidens	Lea	7	Tennessee.
566	5683 6046	U.	camptodon	Say	4	Ohio?
569	5156 5154 4785	U.	obesus	Lea	6	Georgia and North Carolina.
570	5737	U.	Bisselianus	Lea	1	Santee River.
571	5697	U.	Jewettii	Lea	2	Florida.

UNIONIDÆ OF THE GOULD COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	No. of examp.	Locality, etc.
577	5150a	Unio Hopetonensis	Lea	4	Georgia.
578	4786	U. fraternus	Lea	1	Georgia.
588	5153	U. Roanokensis	Lea	2	North Carolina.
596	5182	U. jejunus.	Lea	1	North Carolina.
597	5149	U. complanatus	Sol	9	Various localities.
601	5134	U. planilateris	Conr.	1	North Carolina.
637	5698	U. Buddhianus	Lea	1	Florida.
639	6404	U. lutulentus	Gould	2	New Zealand (in type series).
640	5157	U. Griffithianus	Lea	2	South Carolina.
647	5708	U. Æthiops	Lea	1	Uruguay.
653	5771	U. confertus	Lea	3	Georgia.
654	5687	U. lugubris	Lea	2	Georgia.
655	5708	U. piceus	Lea	3	Uruguay River.
656	5742	U. insulsus	Lea	1	North Carolina.
660	5185	U. tetricus	Lea	1	Georgia.
661	5172	U. Whiteianus	Lea	2½	Savannah River.
679	3996	U. Congaræus	Lea	2	South Carolina.
686	5741	U. declivis	Say	2	Red River.
685	6409	U. manubius	Gould	2	Chihuahua, Mexico (in type series).
687	5189	U. paludicolus	Gould	18	Florida (in type series).
689	5154	U. quadratus	Lea	2	Georgia.
697	5663	U. litoralis	Lam	3	Europe.
698	3393	U. circulus	Lea	4½	Ohio and Wabash Rivers.
699	4780	U. lens	Lea	7½	Ohio.

703	3995	Unio rubellus	Conr	1	Black Warrior River, Alabama.
705	5136	U. rotundatus	Lam	5	Louisiana.
708	6405	U. petrinus	Gould	1	Llanos River, Mexico (in type series).
710	5690	U. Paranensis	Lea	1	Uruguay River.
712	5708	U. disculus	Lea	3	Uruguay River.
714	5690	U. funebralis	Lea	2	Uruguay River.
719	5690	U. patelloides	Lea	1	Uruguay River.
720	5690	U. nocturnus	Lea	1	Uruguay River.
722	4781	U. retusus	Lam	4	Ohio.
723	3890	U. ebenus	Lea	4	Wabash and Mississippi Rivers.
729	4795 3975	U. Kirtlandianus	Lea	5	
731	4799	U. pilaris	Lea	2	Tennessee.
734	3932	U. subrotundus	Lea	6	Ohio.
735	3944	U. coccineus	Hild	8	Ohio and Michigan.
739	5178	U. Shepardianus	Lea	3	Altamaha River, Georgia.
743	4787	U. rectus	Lam	5	St. Peter's River.
748	5183	U. angustatus	Lea	2	South Carolina.
755	5736	U. lanceolatus	Lea	3	Virginia.
757	4784	U. anodontoides	Lea	5	Ohio.
759	5708	U. paralellopipodon	Lea	2	Uruguay River.
762	6254	U. Cailliaudii	Fer	1	River Nile.
765	5662	U. tumidus	Retz	2	Europe.
766	5674 5762	U. pictorum	Retz	9	Europe.
772	5179 5174	U. nasutus	Say	5	Various localities.
773	4767	U. Mississippiensis	Conr	5	Mississippi River.
787	5175	U. Fisheranus	Lea	2	Potomac River.
790	4788	U. aheneus	Lea	2	Florida.
792	......	U. marginalis	Lam	4	India.

UNIONIDÆ OF THE GOULD COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	No. of examp.	Locality, etc.
793	5186	Unio iris	Lea	1	?
794	5193	U. Novi Eboraci	Lea	6	Michigan.
796	4770	U. tenuissimus	Lea	5	Ohio ?
798	5646	U. Corrianus	Lea	2	India.
801	3974	U. phaseolus	Hild	5	Ohio.
804	4783	U. gibbosus	Barnes	5	Ohio and Michigan.
811	5137	U. purpuratus	Lam	4	Louisiana.
814	5163	U. triangulatus	Lea	3	Tennessee.
816	5176	U. caprinus	Lea	1	Mexico.
818	6043	U. Brownii	Lea	1	Mocha.
829	5173	U. Tappanianus	Lea	3	Pennsylvania.
833	5668	U. crassus	Retz	1	Europe.
835	5161	U. monodontus	Conr	3	Alabama.
838	......	U. emarginatus ?	Lea	3	Burmah.
840	5526	Margaritana complanata	Barnes	3½	Ohio.
841	5135	M. confragesa	Say	5	Louisiana.
843	5533	M. marginata	Say	5	Ohio.
844	5524	M. rugosa	Barnes	5	Western Rivers.
846	5529	M. deltoidea	Lea	6	Ohio or Michigan.
849	5531 5532	M. undulata	Say	4	New York and New England.
852	5538	M. Raveneliana	Lea	1	Tennessee.
855	5537 5158	M. Georgiana	Lea	3½	Georgia.

858	5244 3946	M.	calceola	Lea	5	Ohio.
860	5528	M.	quadrata	Lea	1	Tennessee.
861	5536	M.	Hildrethiana	Lea	6	Ohio.
862	5198	M.	dehiscens	Say	3	Ohio.
865	5525 5527	M.	margaritifera	Linn	11	Maine (5), Newfoundland (2), France (2), Germany (2).
865	6408	M.	var. falcata	Gould	3	California (types).
867	5535	M.	fabula	Lea	1½	Tennessee.
869	6253	Monocondylœa	crebristriata	Anth	1	Pegu.
870	5670	M.	Salwêniana	Gould	1	Rivers Salwen, Tavoy (in type series).
883	......	M.	Pazii	Lea	1	Siam and Burmah.
888	......	M.	Peguensis	Anth	3	East Indies.
895	5314	M.	plicatus	Leach	1	Siberia.
896	5722	M.	? discoidens	Lea	1	China.
897	5505 6415	Anodonta	Wahlamatensis	Lea	2	Oregon.
899	5653	A.	magnifica	Lea	6	China.
901	......	A.	Benedictii	Lea	5	Lake Champlain ?
907	......	A.	cygnea	Linn	14	Europe (varieties).
908	......	A.	micans ?	Anth	½	Texas.
916	5522	A.	Pepiniana	Lea	1	Lake Pepin, Ohio.
919	5696	A.	fragilis	Lam	7	Michigan.
920	5520 5512	A.	Footiana	Lea	5	Michigan Lakes.
923	5516	A.	undulata	Say	1	Delaware River.
926	5517	A.	Wardiana	Lea	9	Ohio.
927	5530	A.	edentula	Say	3	Michigan.
928	5514	A.	pavonia	Lea	1	Ohio.
935	5523	A.	Ferrussaciana	Lea	1½	Ohio.
943	5518	A.	salmonia	Lea	2	Ohio.

UNIONIDÆ OF THE GOULD COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	No. of examp.	Locality, etc.
944	5515 5676	Anodonta imbecillis	Say	8	Ohio.
945	5501 6423	A. implicata	Say	4	New York and New England.
946	5520	A. Dunlapiana	Lea	1	Savannah River.
947	5511 5502	A. fluviatilis	Dillwyn	6	New England.
961	5659	A. glauca	Valen	1	South America.
964	5509	A. plana	Lea	2	Ohio.
965	5679 5508 5511	A. decora ?	Lea	7	Ohio (4), Kentucky (3).
965a	5508	A. decora	Lea	1½	Madison Lakes, Wisconsin.
975	5504.	A. gibbosa	Say	5½	Altamaha River, Georgia.
975	5507p	A. gibbosa var	Say	2	Georgia.
976	5507p	A. louperiana	Lea	5	Georgia.
979	5509	A. grandis	Say	2	Mississippi.
980	5691	A. corpulenta v.	Cooper	1	Upper Mississippi.
980	5508	A. corpulenta	Cooper	½	?
986	5657	A. Trautwiniana	Lea	1	Carthagena, South America.
993?	5693?	A. Forbesiana	Lea	1	Uruguay River.
994	5654	A. Moricandii	Lea	2	Brazil.
995	5678	A. suborbiculata	Say	3	Mississippi River ?
996	5669	A. gibba	Benson	1	Shanghai, China.

1003	5506	A.	Marryatana	Lea	4	Michigan and Nova Scotia.
1007	......	A.	subcylindracea	Lea	5	New York and Western States.
1015	5720	A.	exilis	Lea	1	South America.
1017	5704	A.	obtusa	Spix	2	Brazil.
1022	5701	A.	lato-marginata	Lea	1½	South America.
1025	5703p	A.	trapezialis	Lam	2	Brazil.
1025a	5500 5660	A.	ciconia	Gould	4	Mexico (in type series).
1032	2523g	A.	angulata	Lea	1	California.
1032	6407	A.	angulata	Lea	1	Oregon (*Alas. femoralis* of Gould types).
1041	5703p	A.	sinuosa?	Lam	1	Brazil.
1044	5702	Columba	Blainvilliana	Lea	2	South America (? Chili).
1048	5719	Iridina	ovata	Swain	1	Senegal, Africa.
1058	5721	Spatha	dubia	Gmel	1	Senegal.
1059	5718	S.	cælestis	Lea	2	Gambia, Africa.
1064	5706	Mycetopus	siliquosa	D'Orb	1	South America.

Total of Gould Collection, three hundred and ten species and five varieties, represented in one thousand and forty-two examples.

The above are arranged, serially, in drawers of the Gould Collection, as follows:

In drawer 43	1 to	55	In drawer 48	578 to	765
In drawer 44	58 to	134	In drawer 49	961 to	1,007
In drawer 45	136 to	235	In drawer 50	766 to	867
In drawer 46	236 to	375	In drawer 51	869 to	947
In drawer 47	377 to	577			

UNIONIDÆ OF THE NEW YORK STATE COLLECTION.

Serial number.	Name.	Author.	No. of examp.
15	Unio alatus	Say	3
26	U. gracilis	Barnes	3
28	U. pressus	Lea	3
34	U. undulatus	Barnes	4
66	U. hippapæus	Lea	1
111	U. pustulatus	Lea	3
188	U. triangularis	Barnes	8
194	U. elegans	Lea	3
197	U. heterodon	Lea	5
220	U. rubiginosus	Lea	5
241	U. trigonus	Lea	2
305	U. ellipsis	Lea	2
325	U. ventricosus	Barnes	2
326	U. occidens	Lea	5
331	U. ochraceus	Say	4
339	U. cariosus	Say	4
347	U. multiradiatus	Lea	2
375	U. spatulatus	Lea	4
377	U. ligamentinus	Lam	5
391	U. luteolus	Lam	6
391	U. lat. var. rosaceus	Lam	4
399	U. radiatus	Lam	10
524	U. parvus	Barnes	4
597	U. complanatus	Solander	14
735	U. coccineus	Hild	4
743	U. rectus	Lam	3
757	U. anodontoides	Lea	4
772	U. nasutus	Say	4
793	U. iris	Lea	2
794	U. Novi-Eboraci	Lea	5
801	U. phaseolus	Hild	5
804	U. gibbosus	Barnes	5
821	U. Boydianus	Lea	......
829	U. Tappanianus	Lea	8
840	Margaritana complanata	Barnes	1
843	M. marginata	Say	4
844	M rugosa	Barnes	2
846	M. deltoidea	Lea	2
849	M. undulata	Say	6
861	M. Hildrethiana	Lea	3
865	M. margaritifera	Linn	3
901	Anodonta Benedictii	Lea	4
919	A. fragilis	Lam	2
920	A. Footiana	Lea	5
923	A. undulata	Say	4

UNIONIDÆ OF THE NEW YORK STATE COLLECTION — (*Continued*).

Serial number.	Name.		Author.	No. of examp.
927	Anodonta	edentulata	Say	4
944	A.	imbecillis	Say	5
945	A.	implicata	Say	5
947	A.	fluviatilis	Dill	4
950	A.	Lewisii	Lea	7
951	A.	lacustris	Lea	10
969	A.	gigantea	Lea	1
1007	A.	subcylindracea	Lea	9

Fifty-two species, one variety, represented in two hundred and twenty-seven examples.

UNIONIDÆ OF THE GENERAL COLLECTION.

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp	Locality, remarks, etc.
1	5539	Triquetra corrugata	Lam.	Gould	4	Brazil. (*Hyria corrugata*, Lam.)
2	5145 5544	T. subviridis	Klein	Gould, etc.	5	Brazil. (*Hyria avicularis*, Lam.)
5	.....	Prisodon truncata	Schum.	....	3	Brazil. (*Castalia ambigua*, Lam.)
13	.....	Unio inflatus	Lea	Aldrich	1	Alabama.
15	5142	U. alatus	Say	Gould	14	Western and Western New York Rivers.
15	......	U. do	Say	Emmons	.....	
15	......	U. do	Say	Anthony	......	
15	......	U. do	Say	Pickett	......	
22	......	U. lævissimus	Lea	Anthony	1	Ohio.
26	......	U. gracilis	Barnes	Anthony	1	Ohio.
26	......	U. do	Barnes	Pickett	6	Ohio.
28	5166	U. pressus	Lea	Gould ?	5	New York and Western ?
28	......	U. do	Lea	Anthony	2	Ohio.
31	5132	U. multiplicatus	Lea	Gould	5	Ohio. (*U. heros*, Say)
31	......	U. do	Lea	Anthony	1	Ohio.
31	......	U. do	Lea	Pickett	2	Ohio.
34	5139	U. undulatus	Barnes	Gould	3	Ohio River.
34	......	U. do	Barnes	Anthony	6	Ohio River.
34	......	U. do	Barnes	....	3	Tennessee.
36	......	U. atrocostatus	Lea	Anthony	2	Alabama.
39	......	U. infucatus	Conrad	Anthony	4	Georgia.
39	......	U. do	Conrad	?	2	Georgia.
40	......	U. Kleinianus	Lea	Newcomb.	1	Georgia.
40	......	U. do	Lea	Anthony	2	Georgia.

44	......	U.	foliatus	Hild.	Emmons.	2	Ohio (females).
44	......	U.	do	Hild.	Anthony.	2	Ohio (males).
45	......	U.	cælatus	Conrad.	Newcomb	2	Tennessee River.
45	......	U.	do	Conrad.	Anthony.	2	Tennessee River.
58	5713	U.	Tavoyensis	Gould	Gould.	8	India.
62	5141	U.	pliciferus	Lea.	Gould.	3	Mexico. (*U. plaxus*, Conrad.)
62	......	U.	do	Lea.	Anthony.	2	Mexico.
65	......	U.	latecostatus	Lea.	Aldrich.	1	Alabama.
72	5686	U.	trapezoides	Lea.	Gould.	$10\frac{3}{2}$	Washita.
72	......	U.	do	Lea.	Gebhard.	1	Mississippi.
72	......	U.	do	Lea.	Anthony.	3	Louisiana.
76	6251	U.	ellipticus	Spix	Gould.	......	Brazil.
76	5689	U.	do	Spix.	Gould.	......	Brazil.
79	......	U.	subtentus	Say.	Anthony.	4	Tennessee.
79	......	U.	do	Say.	Newcomb	1	Tennessee.
79	......	U.	do	Say.	Aldrich.	1	Tennessee.
81	......	U.	Osbeckii.	Phili.	Lewis.	1	Fuhchan, China. (*U. Shanghaiensis*, Lea.)
83	......	U.	Conradianus.	Lea.	Newcomb.	1	Tennessee.
83	5148	U.	do	Lea.	Gould.	$\frac{5}{2}$	Tennessee.
83	......	U.	do	Lea.	Anthony.	7	Tennessee.
84	......	U.	rubellinus	Lea.	Aldrich.	3	Montevallo, Alabama.
102	......	U.	lachrymosus	Lea.	Emmons.	1	Ohio.
102	......	U.	do	Lea.	Newcomb.	1	Ohio.
102	3954	U.	do	Lea.	Gould.	5	Ohio.
102	......	U.	do	Lea.	Anthony.	2	Ohio.
103	......	U.	Forsheyi	Lea.	Anthony.	1	Alabama.
103	......	U.	do	Lea.	Aldrich.	1	Alabama.
108	......	U.	fragosus	Conrad.	Anthony.	1	Ohio.
111	......	U.	pustulatus.	Lea.	?	2	Ohio.
112	3986	U.	Schoolcraftii	Lea.	Gould.	5	Michigan.
112	......	U.	do	Lea.	Emmons.	2	Michigan ?

UNIONIDÆ OF THE GENERAL COLLECTION— (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
112	......	Unio Schoolcraftii	Lea	Anthony	2	Michigan.
114	......	U. asper	Lea	?	1	Washita.
114	3985	U. do	Lea	Gould	10	Louisiana.
116	......	U. stapes	Lea	Aldrich	1	Alabama River.
118	......	U. sparsus	Lea	Anthony	1	Tennessee.
119	......	U. metanever	Rafin	Pickett	3	Ohio?
119	......	U. do	Rafin	Anthony	2	Ohio.
120	......	U. Wardii	Lea	Pickett	1	Ohio?
121	......	U. intermedius	Conrad	Newcomb	2	Tennessee.
121	......	U. do	Conrad	Anthony	2	Tennessee
122	......	U. cornutus	Barnes	Aldrich	2	Alabama.
122	......	U. do	Barnes	Anthony	2	Ohio.
122	......	U. do	Barnes	Emmons	3	Ohio.
122	4519	U. do	Barnes	Gould	3	Ohio.
122	——	U. do	Barnes	Gould	1	Ohio.
123	......	U. pustulosus	Lea	Pickett	1	Ohio River?
123	......	U. do	....	Anthony	3	Ohio River?
123	3968 3948	U. do	....	Gould	5	Ohio.
124	......	U. sphaericus	Lea	Anthony	2	Alabama River.
125	......	U. asperatus	Lea	Aldrich	3	Alabama River.
128	3987	U. turgidus	Lea	Gould	5	Louisiana. (*U. Mortoni* Conrad.)
128	......	U. do	Lea	Anthony	1	Mississippi.
129	......	U. Cooperianus	Lea	Newcomb	1	Tennessee.

129	......	U.	Cooperianus	Lea	Anthony	1	Ohio.
130	3955	U.	verrucosus	Barnes	Gould	3	Wabash.
130	......	U.	do	Barnes	Anthony	2	Ohio.
132	......	U.	graniferous	Lea	Emmons	1	Ohio.
132	......	U.	do	Lea	?	2	Tennessee.
134	......	U.	irroratus	Lea	Anthony	4	Ohio.
134	......	U.	do	Lea	Pickett	1	Ohio.
134	......	U.	do	Lea	?	1	Tennessee.
135	......	U.	caperatus	Lea	Lewis	2	Tennessee.
135	......	U.	do	Lea	?	1	Tennessee.
136	......	U.	dromas	Lea	Newcomb	2	Tennessee.
136	......	U.	do	Lea	Anthony	2	Tennessee.
139	......	U.	Æsopus	Green	Anthony	2	Ohio.
140	......	U.	varicosus	Lea	Newcomb	1	Ohio. (*U. cicatricosus* Say.)
140	......	U.	do	Lea	Anthony	1	Ohio.
141	......	U.	perplexus	Lea	Anthony	4	Ohio (males and females).
141	......	U.	do	Lea	?	6	Tennessee.
142	......	U.	propinquus	Lea	Anthony	8	Tennessee (males and females).
142	......	U.	do	Lea	Anthony	7	Tennessee (young).
144	......	U.	Leaii	Gray	Emmons	1	China.
146	......	U.	tuberculatis	Barnes	Pickett	3	Ohio?
146	......	U.	do	Barnes	Anthony	3	Ohio?
148	......	U.	cylindricus	Say	Emmons	3	Ohio.
148	......	U.	do	Say	Anthony	4	Ohio.
148	3490	U.	do	Say	Gould	4	Ohio.
150	......	U.	collinus	Conrad	Anthony	2	Virginia.
155	......	U.	negatus	Lea	Aldrich	2	Alabama.
165	......	U.	stramineus	Conrad	Anthony	1	Alabama.
165	......	U.	do	Conrad	Newcomb	1	Alabama.
183	......	U.	arcæformis	Lea	Anthony	2	Tennessee. (*U. nexus* Say.)
183	......	U.	do	Lea	Newcomb	1	Tennessee.

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
183	3938	Unio arcæformis	Lea.	Gould.	3	Tennessee.
188	......	U. triangularis.	Barnes.	Anthony.	3	Ohio. (*U. formosus* Lea.)
188	3981	U. do	Barnes.	Gould	5	Ohio.
194	......	U. Foremanianus.	Lea.	Anthony.	1	Alabama.
194	......	U. elegans.	Lea.	Emmons.	4	Ohio.
195	......	U. donaciformis.	Lea.	Emmons.	1	Ohio.
195	......	U. do	Lea.	Anthony.	2	Ohio.
195	......	U. do	Lea.	Newcomb.	1	Ohio.
196	......	U. zigzag.	Lea.	?	1	Ohio.
197	......	U. heterodon.	Lea	Anthony.	2	Massachusetts.
198	......	U. penitus.	Conrad	Aldrich	1	Alabama.
200	......	U. securis	Lea	Pickett.	1	Ohio.
200	......	U. do	Lea	Aldrich	1	Alabama.
200	......	U. do	Lea	Emmons.	2	Ohio.
200	......	U. do	Lea	Anthony.	2	Ohio.
203	......	U. ovatus	Say	?	3	Ohio.
203	......	U. do	Say	Anthony.	1	Ohio.
205	......	U. excavatus.	Lea	Anthony.	3	Alabama.
205	......	U. do	Lea	Aldrich	1	Alabama.
206	......	U. perradiatus.	Lea	?	2	Tennessee.
210	......	U. subovatus	Lea	Pickett.	1	Ohio.
211	......	U. crassidens	Lam.	Gould	1	Ohio.
211	......	U. do	Lam.	Aldrich	1	Alabama.
211	......	U. do	Lam.	Anthony.	2	Ohio River.

212	......	U.	incrassatus	Lea	Anthony	2	Georgia.
215	......	U.	Forbesianus	Lea	Lewis	1	Georgia.
216	......	U.	gibber	Lea	Anthony	2	Tennessee.
220	......	U.	rubiginosus	Lea	Anthony	2	Ohio.
220	......	U.	do	Lea	Pickett	2	Genesee Valley Canal.
220	3944	U.	do	Lea	Gould	6	Michigan and Ohio.
229	......	U.	Bigbyensis	Lea	Anthony	3	Tennessee.
235a	......	U.	Lawii	Lea	Anthony	2	Tenn. (Observations, Lea Vol. XIII).
235a	......	U.	do	Lea	Newcomb	1	Tennessee.
235a	......	U.	do	Lea	?	2	Tennessee.
236	......	U.	personatus	Say	Anthony	1	Ohio (*U. pileus* Lea, male).
236	......	U.	do	Say	?	1	Ohio.
237	......	U.	Stewardsonii	Lea	Anthony	1	Tennessee (female).
237	......	U.	do	Lea	Newcomb	2	Tennessee (males).
237	......	U.	do	Lea	?	1	Tennessee (male).
239	......	U.	Sowerbyanus	Lea	Anthony	4	Tennessee (male of Haysianus Lea).
239	......	U.	do	Lea	Newcomb	3	Tennessee.
241	......	U.	trigonus	Lea	Pickett	4	Indiana ?
252	......	U.	tumescens	Lea	?	6	Tennessee.
251	......	U.	Holstonensis	Lea	Lewis	1	Little Tennessee River, Tenn.
256	......	U.	solidus	Lea	?	1	Ohio ?
256	......	U.	do	Lea	Aldrich	1	Alabama.
257	......	U.	obliquus	Lam	Anthony	2	Ohio.
257.	3953	U.	do	Lam	Gould	2	?
257	......	U.	do	Lam	Gebhard	1	Wabash.
257	......	U.	do	Lam	?	2	Tennessee.
258	......	U.	plenus	Lea	Newcomb	3	Tennessee.
258	......	U.	do	Lea	Emmons	1	Ohio.
258	......	U.	do	Lea	?	3	? (young).
258	......	U.	do	Lea	Aldrich	2	Alabama.
259	3948	U.	pyramidatus	Lea	Gould	6	Ohio.

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
259	......	Unio pyramidatus	Lea	Picket	1	Ohio.
259	......	U. do	Lea	?	1	Ohio.
259	......	U. do	Lea	Aldrich	1	Alabama.
259	......	U. do	Lea	Anthony	2	Ohio.
261	......	U. Edgarianus	Lea	Anthony	5	Tennessee.
261a	......	U. Tuscumbiensis	Lea	Lewis	2	Poplar Creek, Roane county, Tenn.
262	......	U. Mooresianus	Lea	Newcomb	1	Tennessee.
264	......	U. Troostii	Lea	Anthony	4	Tennessee.
264	......	U. do	Lea	Newcomb	1	Tennessee.
279	......	U. interventus	Lea	Aldrich	3	Alabama.
282	......	U. consanguineus	Lea	Aldrich	1	Alabama.
283	......	U. Chattanoogaensis var.	Lea	Aldrich	3	Alabama.
283	......	U. do type.	Lea	Anthony	1	Alabama.
286	......	U. clavus	Lam	Emmons	4	Ohio.
286	3971	U. do	Lam	Gould	7	Sciota River, Ohio.
286	......	U. do	Lam	Pickett	2	Wabash River, Indiana.
287	......	U. patulus	Lea	Anthony	2	Ohio.
......	......	U. acuens	Lea	?	1	Tennessee.
289	......	U. mundus	Lea	?	3	Tennessee.
289	......	U. do	Lea	Newcomb.	3	Tennessee.
292	......	U. argenteus	Lea	Anthony	2	Tennessee.
292a	......	U. brevis	Lea	Newcomb.	1	Tennessee.
292b	......	U. Conasaugænsis	Lea	Lewis	2	Tennessee.
301	4029	U. Rangianus	Lea	Gould	10	Sciota River, Ohio.

303	......	U.	sulcatus	Lea	Anthony	1	Ohio. (*U. ridibundus*, Say, is female.)
304	......	U.	Haysianus	Lea	Anthony	3	Tenn. (The male is *Sowerbyanus*, Lea.)
304	......	U.	do	Lea	Newcomb.	3	Tennessee.
305	......	U.	ellipsis	Lea	Anthony	2	Ohio.
305	......	U.	do	Lea	Emmons	1	Ohio.
305	4518	U.	do	Lea	Gould	3	Ohio.
305	4798	U.	do	Lea	Gould	2	Ohio (young.)
320	......	U.	spissus	Lea	Anthony	1	Satilla River, Georgia.
321	......	U.	Downiei	Lea	Anthony	2	Georgia.
321	......	U.	do	Lea	Newcomb.	1	Georgia.
324	......	U.	perdix	Lea	Anthony	2	Tennessee.
326	......	U.	occidens	Lea	Pickett	1	Ohio ?
326	4021 4026	U.	do	Lea	Gould	4	Ohio ?
326	......	U.	do	Lea	Anthony	2	Ohio ?
328	......	U.	dolabræformis	Lea	Anthony	2	Altamaha River, Georgia.
328	......	U.	do	Lea	Newcomb	1	Altamaha River, Georgia.
329	......	U.	capax	Green	Emmons	1	Ohio ?
329	......	U.	do	Green	Anthony	1	Indiana ?
330	......	U.	splendidus	Lea	Anthony	1	Altamaha River, Georgia.
330	5165	U.	do	Lea	Gould	1½	Altamaha River, Georgia.
330	......	U.	do	Lea	Newcomb.	1	Altamaha River, Georgia.
331	4019	U.	ochraceus	Say	Gould	9	New England and New York.
331	......	U.	do	Say	?	1	Troy, N. Y. (Canal.)
339	4027	U.	cariosus	Say	Gould	9	New England and New York.
339	......	U.	do	Say	?	2	New York.
339	.....	U.	do	Say	Gebhard	2	Schoharie Creek, New York.
339	.....	U.	do	Say	Anthony	2	Pennsylvania.
339	......	U.	do	Say	?	3	Washington, D. C.
347	3994	U.	multiradiatus	Lea	Gould	2	Tennessee and Ohio.
347	......	U.	do	Lea	Anthony	4	Ohio.

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
351		Unio capsæformis	Lea	Newcomb	1	Tennessee.
351		U. do	Lea	Anthony	3	Tennessee.
353		U. turgidulus	Lea	Anthony	1	Tennessee.
354		U. Florentinus	Lea	Newcomb.	2	Tennessee.
358		U. pictus	Lea	Anthony	1	Harpette River, Tennessee.
365		U. Menkianus	Lea	Anthony	1	Tennessee.
367		U. Lindsleyi	Lea	Anthony	1	Tennessee.
371		U. exiguus	Lea	Anthony	2	Georgia.
371		U. do	Lea	Newcomb.	2	Georgia.
375		U. spatulatus	Lea	?	6	Michigan.
377	4022	U. ligamentinus	Lam	Gould	7	Michigan and Ohio. (*U. crassus*, Say.)
377	4761	U. do	Lam	Gould	2	Michigan ? (young).
382		U. orbiculatus	Hildreth	Emmons	2	Ohio. (*U. abruptus*, Say.)
385		U. Hydianus	Lea	Anthony	1	Louisiana.
391		U. luteolus	Lam	Pickett	3	Canandaigua Lake, N. Y.
391		U. do	Lam	Dewey ?	4	Genesee River, N. Y.
391	5160	U. do	Lam	Gould	½	Ohio.
391		U. do	Lam	Gould	2	Lake Superior.
391		U. do	Lam	?	2	?
399		U. radiatus	Lam	Pickett	4	Near Troy, N. Y.
399		U. do	Lam	Gebhard	4	Connecticut River.
399		U. do	Lam	?	1	Schuyler's Lake, N. Y.
399		U. do	Lam	?	1	——— ? N. Y.
399		U. do	Lam	?	1½	——— ? N. Y.

407	......	U.	amœnus ?	Lea	Anthony	2	Tennessee.
414	......	U.	subangulatus	Lea	Newcomb.	1	Chattahooche River, Georgia.
414	......	U.	do	Lea	Anthony	2	Chattahooche River, Georgia.
415	......	U.	sparus	Lea	Anthony	2	Tennessee.
426	......	U.	concestator	Lea	Anthony	2	Georgia.
426	......	U.	do	Lea	Newcomb.	1	Georgia.
427	4769	U.	lienosus	Conrad	Gould	2	Alabama ?
430	4779	U.	Nashvillensis	Lea	Gould	3	Tennessee.
430	......	U.	do	Lea	Anthony	2	Tennessee.
433	......	U.	intercedens	Lea	Newcomb.	1	Georgia.
434	......	U.	fallax	Lea	Anthony	2	Georgia.
434	......	U.	do	Lea	Newcomb.	1	Georgia.
438	......	U.	proximus ?	Lea	Anthony	3	Tennessee.
441	......	U.	Pybasii	Lea	Lewis	6	Tennessee.
441	......	U.	do	Lea	Anthony	2	Tennessee.
445	......	U.	Vanuxemi ?	Lea	Anthony	2	Tennessee.
446	......	U.	constrictus?	Conrad	Anthony	2	Virginia.
471	......	U.	Menzieni	Gray	Smith.Ins.	1	New Zealand.
477	......	U.	Vescoi	Bourg	Lewis	4	Tigris, Assyria.
480	......	U.	Bengalensis	Lea	Newcomb.	2	"Phillipine Islands." (Newcomb.)
480	......	U.	verecundus	Gould	Smith.Ins.	1	Manilla = Bengalensis, Lea.
480	......	U.	do	Gould	Anthony	1	Rivers of Bengal. (Lea.)
494	......	U.	Batavus	Lam	Ingalls	1	Europe.
494	5664 5685	U.	do	Lam	Gould	5	Europe.
500	5181	U.	Buckleyi	Lea	Gould	4	Florida.
506	5950	U.	fuscatus	Lea	Gould	4	Florida.
508	5951	U.	occultus	Lea	Gould	7	Florida.
511	......	U.	Cumberlandicus	Lea	Newcomb.	1	Tennessee.
511	......	U.	do	Lea	Anthony	2	Tennessee.
520	......	U.	fabalis	Lea	Emmons	4	Tennessee. (*U. lapillus*, Say.)

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
520	......	Unio fabalis	Lea	Anthony	2	Ohio.
521	......	U. paulus	Lea	Anthony	1	Georgia.
524	......	U. parvus	Barnes	Anthony	5	Ohio.
533	6044	U. Haleianus	Lea	Gould	3	Louisiana.
536	......	U. glans	Lea	Anthony	2	Indiana.
555	......	U. simus	Lea	Newcomb.	1	Tennessee.
563	......	U. brevidens	Lea	Newcomb.	1	Tennessee (female).
563	......	U. do	Lea	Anthony	3	Tennessee (1 male, 2 females).
566	......	U. camptodon	Say	Lewis	4	Ohio. (*U. Sayi*, Ward and Tappan.)
566	......	U. do ?	Say	Anthony	1	Ohio.
566	5683	U. do	Say	Gould	7½	?
.....	......	U. n. sp. ?	......	Smith. Ins	1	South America.
567	......	U. Columbensis	Lea	Anthony	2	Georgia.
567	......	U. do	Lea	Anthony ?	1	Georgia.
567	......	U. do	Lea	Newcomb.	1	Georgia.
569	......	U. obesus	Lea	Newcomb.	1	Georgia.
569	......	U. do	Lea	Anthony	2	Georgia.
569	......	U. do	Lea	Newc'mb?	1	Georgia.
569	5156	U. do	Lea	Gould	2	Georgia.
577	5150	U. Hopetonensis	Lea	Gould	5	Georgia.
577	5150	U. do	Lea	Anthony	2	Georgia.
578	......	U. fraternus	Lea	Anthony	1	Georgia.
581	......	U. Savannahensis	Lea	Lewis	1	Georgia.
588	......	U. Roanoakensis	Lea	?	1	North Carolina.

598		U.	jejunus	Lea	Anthony	2	Roanoke, N. C.
597		U.	complanatus	Solander	?	1	Hudson River.
597		U.	do	Solander	?	1	Erie Canal, Troy, N. Y.
597	5147	U.	do	Solander	Gould	2	?
597		U.	do	Solander	Anthony	1	Maryland.
597	5149	U.	do	Solander	Gould	4	New England.
597		U.	do	Solander	Gebhard	3	Connecticut River.
597	5149	U.	do	Solander	Gould	1	Lake Superior.
598		U.	Northamptonensis	Lea	?	1½	?
599		U.	percoarctatus	Lea	Anthony	2	North Carolina.
607		U.	Hallenbeckii	Lea	Anthony		Columbus, Georgia.
639		U.	lutulentus	Gould	Smith. Ins	3	New Zealand.
639a		U.	———		Smith. Ins	1	Fijii.
654		U.	lugubris	Lea	?	2	Georgia.
654		U.	do	Lea	Anthony	3	Georgia.
670		U.	tortius	Lea	Anthony	1	Chattahoochee River, Georgia.
684		U.	subplanus	Conrad	Anthony	2	Virginia.
686		U.	declivis	Say	Emmons	1	Georgia?
686		U.	do	Say	Newcomb	1	Georgia?
697		U.	litoralis	Lam	?	1	Europe — England?
698		U.	circulus	Lea	Emmons	6	Ohio.
698		U.	do	Lea	Gebhard	1	Indiana.
699		U.	lens	Lea	Pickett	3	Ohio? (Transitional form.)
699		U.	do	Lea	?	2	? (Typical form.)
705		U.	rotundatus	Lam	Anthony	1	Louisiana.
705	5136	U.	do	Lam	Gould	4	Louisiana.
714	5690	U.	funebralis	Lea	Gould	2	Uruguay River, S. A.
722		U.	retusus	Lam	Emmons	2	Ohio.
722		U.	do	Lam	Anthony	4	Ohio.
723		U.	ebenus	Lea	Aldrich	2	Alabama.
723		U.	do		Anthony	2	Ohio.

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
723	3980	Unio ebenus	Lea	Gould	2	Ohio.
723		U. do	Lea	Pickett	1	Ohio.
723a		U. subglobatis	Lea	?	1	Tennessee (observations, Vol. XIII).
724		U. Lesueurianus	Lea	?	1	Tennessee.
729		U. Kirtlandianus	Lea	Gould	2	Ohio.
732		U. dolabelloides	Lea	Anthony	1	Tennessee.
733		U. Thorntonii	Lea	Newcomb	1	Tennessee.
733		U. do	Lea	?	2	Tennessee.
734		U. subrotundus	Lea	Emmons	2	Ohio.
734	3932	U. do	Lea	Gould	6	Ohio (young).
734		U. do	Lea	Emmons	2	Ohio.
734	3961	U. do	Lea	Gould	1	Ohio.
734		U. do	Lea	Anthony	2	Ohio.
735	3644	U. coccineus	Hildreth	Gould	17	Ohio and Michigan.
739		U. Shepardianus	Lea	Anthony	2	Altamaha River, Georgia.
739	5178	U. do	Lea	Gould	5	Altamaha River, Georgia.
739		U. do	Lea	Gebhard	3	Altamaha River, Georgia.
743		U. rectus	Lam	?	2	Western New York and Canada.
750		U. sublatus	Lea	Aldrich	2	Montevallo, Alabama.
755		U. lanceolatus	Lea	Anthony	6	Virginia.
755		U. do	Lea	Newcomb	2	Virginia.
757	5682	U. anodontoides	Lea	Gould	16	Ohio.
757		U. do	Lea	Anthony	4	Ohio.
765		U. tumidus	Retzius	——	1	England.

766	5665	U.	pictorum	Linn.	Gould.	2	France ?
766	5674 5684	U.	do	Linn.	Gould.	8	Europe.
766	......	U.	do	Linn.	?	1	British.
766	......	U.	do	Linn.	Ingalls.	1	France.
766	......	U.	do	Linn.	Anthony?	1	Europe.
766	5762	U.	do	Linn.	Gould.	8	Spain ("U. rostrata" Gould label).
772	......	U.	nasutus	Say.	Anthony.	2	Ohio.
772	......	U.	do	Say.	Aldrich.	2	Troy, N. Y.
773	......	U.	Mississippiensis	Conrad.	Gebhard.	2	Mississippi River.
773	......	U.	do	Conrad.	Anthony.	2	Louisiana.
773	4767	U.	do	Conrad.	Gould.	3	Mississippi River.
786	......	U.	pullatus	Lea	Newcomb	1	
786	......	U.	do	Lea	Anthony.	1	
787	......	U.	Fisherianus	Lea	Anthony.	1	Potomac.
792	......	U.	marginalis	Lam.	Anthony.	1	East Indies.
794	......	U.	Novi-Eboraci	Lea	?	4	Michigan.
794	......	U.	do	Lea	?	2	Genesee River, N. Y.
794	......	U.	do	Lea	Anthony.	2	Michigan.
795	......	U.	fatuus	Lea	Anthony.	2	Tennessee.
796	......	U.	tenuissimus	Lea	Emmons.	2	Ohio.
796	......	U.	do	Lea	Anthony.	1	Ohio.
796	4770	U.	do	Lea	Gould	2	Ohio.
801	5143 3974	U.	phaseolus	Hild Barnes	Gould	4	Ohio (*U. dilatatus* ref. of Anthony).
804	......	U.	gibbosus	Barnes	Anthony.	2	Ohio.
804	......	U.	do		Pickett	4	Indiana ? and Tennessee.
804	......	U.	do	Barnes	Aldrich	1	Detroit, Michigan.
804	5182	U.	do	Barnes	Gould	1	Tennessee (*U. jejunus* in Gould Coll.).
804	4783	U.	do	Barnes	Gould	14	Ohio and Michigan.
804	4789	U.	do	Barnes	Gould	2½	Ohio and Tennessee.

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial number.	Gould number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
805		Unio subgibbosus	Lea	Anthony	2	Alabama.
811	5137	U. purpuratus	Lam	Gould	1	Louisiana (*U. ater*, Lea).
811		U. do	Lam	Aldrich	1	Alabama.
814		U. biangulatus	Lea	?	1	Tennessee.
823		U. pellucidus	Lea	Anthony	2	Chattahooche River, Georgia.
829		U. Tappanianus	Lea	Anthony	1	North Carolina ?
		U. do	Lea	Lewis	7	Erie Canal, Herkimer Co., N. Y.
832		U. obtusus	Lea	Anthony	2	Chattahooche River, Georgia.
832		U. do	Lea	Newcomb.	1	Chattahooche River, Georgia.
		U. Tellicoensis	Lea	Lewis	1	Tellico River, Tennessee.
		U. appressus	Lea	Lewis	1	Clinch River, Anderson Co., Tenn.
835		U. monodontus	Say	Anthony	2	Ohio.
835		U. do	Say	Pickett	1	Ohio.
840	5526	Margaritana complanata	Barnes	Gould	2	Ohio River.
840		M. do	Barnes	?	1	?
843	5532	M. marginata	Say	Gould	4	Western Rivers.
843		M. do	Say	Anthony	4	Ohio and North Carolina.
843		M. do	Say	Emmons	1	Ohio ?
843		M. do	Say	?	1	? (Truncate variety.)
843		M. do	Say	?	1	Ohio ?
843		M. do	Say	Pickett	1	Geneva Lake, Wisconsin.
844		M. rugosa	Barnes	Emmons	1	Ohio ? (very large).
844		M. do	Barnes	Aldrich	2	Canal, Troy, N. Y.
844		M. do	Barnes	?	2	Ohio.

844	5524	M.	do	Barnes	Gould	7	Western Rivers.
846	5529	M.	deltoidea	Lea	Gould	13½	Ohio and Michigan.
846	......	M.	do	Lea	Anthony	2	Ohio.
846	......	M.	do	Lea	Emmons	15	Ohio ?
846	......	M.	do	Lea	?	1	Ohio ?
849	......	M.	undulata	Say	?	1	New York.
849	......	M.	do	Say	Beck	2	Lake Pleasant, N. Y.
849	......	M.	do	Say	Lewis	5	Herkimer Co., N. Y.
849	5532	M.	do	Say	Gould	2	New England and New York.
849	......	M.	do	Say	Anthony	1	Maryland.
......	......	M.	triangulata	Lea	Anthony	1	Chattahooche River, Georgia.
......	......	M.	do	Lea	?	1	Chattahooche River, Georgia.
853	......	M.	Elliottii	Lea	Anthony	2	Columbus, Georgia.
853	......	M.	do	Lea	?	1	Columbus, Georgia.
855	......	M.	Georgiana	Lea	Anthony	3	Georgia (labeled Etowahensis, Conr.).
855	......	M.	do	Lea	Anthony	1	Georgia (*Alas. impressa*, Anthony).
858	......	M.	calceola	Lea	Anthony	2	Ohio (type).
858	......	M.	do	Lea	Newcomb.	1	Ohio ?
861	5536	M.	Hildrethiana	Lea	Gould	4	Ohio ? (*Alas. ambigua*, Say).
862	......	M.	dehiscens	Say	Anthony	2	Ohio (*U. oriens*, Lea).
865	......	M.	margaritifera	Linn	Emmons	1	Maine ? (*Alas. urcuata*, Barnes).
865	......	M.	do	Linn	Smith. Ins.	1	Col. R., Oregon (*Alas. falcata*, Gould).
865	5525	M.	do	Linn	Gould	1	Lake Champlain.
865	5627	M.	do	Linn	Gould	3	France, 2; 1 ?
865	......	M.	do	Linn	Anthony	1	Connecticut.
866	......	M.	Holstonia	Lea	Lewis	5	Monroe Co., Tennessee.
867	......	M.	fabula	Lea	Anthony	3	"Virginia" (Cumber. Riv., Tenn. ?).
867	......	M.	do	Lea	?	1	?
879	......	Monocondylea	Bonellii	Fer	Anthony	1	River Po, Europe.
894	......	M.	Mardinensis	Lea	Lewis	2	River Tigris, Assyria.
897	......	Anondonta	Wahlamatensis	Lea	Smith. Ins.	1	California.

UNIONIDÆ OF THE GENERAL COLLECTION — (*Continued*).

Serial Number.	Gould Number.	Name.	Author.	Source.	No. of examp.	Locality, remarks, etc.
	......	Anondonta Wahlamatensis	Lea	Lewis	1	Clear Lake, Cal.
901	......	A. Benedictii	Lea	?	3	Champlain Canal and Lake.
907	......	A. cygnea	Linn	Gould	25	Europe.
907	5058	A. do	Linn	Gould	2½	Europe.
907	5652	A. do	Linn	Gould	1	Staffordshire, England.
913	......	A. Oregonensis	Lea	Smithson.	1	Oregon, Wahlamat River.
927	......	A. edentula	Say	Tartwell	1	Seneca Co., N. Y.
927	......	A. do	Say	?	3	Ohio and Michigan.
927	......	A. do	Say	Pickett	1	?
928	......	A. pavonia	Lea	Newcomb.	2	Ohio.
935	......	A. Ferrusaciana	Lea	Newcomb.	2	Ohio.
945	......	A. implicata	Say	?	1	Troy, N. Y. (*A. Newtonensis*, Lea).
945	5501	A. do	Say	Gould	2½	Massachusetts.
945	5513	A. do	Say	Gould	2	Massachusetts (*A. Housatonica*, Linds).
947	5502	A. fluviatilis	Dill	Gould	17	Massachusetts ? (5511, 2).
947	......	A. do	Dill	Aldrich.	2	Troy, N. Y.
947	......	A. do	Dill	?	2	New York.
947	......	A. do	Dill	Gebhard	1	Schoharie, N. Y.
944	......	A. imbecillis	Say	?	2	Ohio.
951	......	A. lacustris	Lea	?	2	Herkimer Co., N. Y.
951	......	A. do	Lea	Aldrich.	1	Cedar Lake, N. Y.
951	......	A. do	Lea	?	1	New York ? (large).
958	......	A. Mortoniana	Lea	Anthony	1	Rio Parana, S. America.

962	......	A.	do	Lea	Emmons.	1	? (old).
964	......	A.	plana	Lea	Emmons.	2	Ohio River ?
964	......	A.	do	Lea	Anthony.	1	Ohio River ?
965	......	A.	decora..........	Lea	Aldrich. .	1	Ohio.
965	......	A.	do	Lea	?........	1	Ohio.
975	......	A.	subglosa........	Say	Anthony.	1	Altamaha River, Georgia.
975	......	A.	do	Say	Newcomb.	1	Altamaha River, Georgia.
979	......	A.	grandis.........	Say	Pickett ..	6	Indiana.
995	5510	A.	suborbiculatus...	Say	Gould ...	½	Indiana or Illinois.
1007	......	A.	subcylindracea ..	Lea	Pickett ..	4	?
1007	......	A.	do ..	Lea	Newcomb.	2	Oak Orchard Creek, N. Y.
1007	......	A.	do ..	Lea	?........	1	?
1007	......	A.	do ..	Lea	Anthony.	3	Michigan.
1007	......	A.	do ..	Lea	Newcomb.	1	Mud Creek, Wayne Co., N. Y.
1009	......	A.	Buchanensis ?...	Lea	Newcomb.	1	Ohio.
1022	......	A.	lato-marginata ..	Lea	?........	1	Rio Parana, S. America.
1025	......	A.	trapezialis	Lam	Emmons.	1	South America.
1032	......	A.	angulata........	Lea	Smithson.	1	Sacramento River, California.
1032	......	A.	do	Lea	Smithson.	1	Oregon (*Alas. feminalis*, Gould).
1032	......	A.	do	Lea	Lewis . . .	1	Idaho.
1048	......	Iridina ovata		Swains ..	Anthony.	1	Senegal, Africa.

Total of General Collection two hundred and fifty-four species, represented in (1197 + ? 18) twelve hundred and fifteen examples. Of these sixty-eight species are not contained in the Gould Collection. The New York Collection contains four additional species, giving for the entire number of Unionidæ in the Museum Collections, three hundred and eighty-two species.

LAND SHELLS OF THE NEW YORK STATE COLLECTION.

Name.		Author.	Source.	No. of examp.	Locality, etc.
Genus.	Sub-genus. sp.				
Helix	Helicodiscus lineatus	Say	Aldrich	3	Maine.
	Patula solitaria	Say	Lewis	6	Ohio.
	P. atternata	Say	?	13	New York.
	P. do	Say	Aldrich	3	Palmyra, Wayne county, N. Y.
	P. do	Say	Aldrich	2	Troy.
	P. perspectiva	Say	Aldrich	18	Albany.
	P. do	Say	?	4	New York.
	Strobila labyrinthica	Say	Hubbard	25	Staten Island.
	Stenotroma hirsuta	Say	Aldrich	2	Franklin, N. J.
	S. do	Say	?	3	New York.
	S. monodon	Rackett	Aldrich	2	Essex.
	S. do	Rackett	Lewis	8	Herkimer county.
	Triodopsis palliata	Say	?	3	New York.
	T. appressa	Say	Lewis	6	Ohio.
	T. do	Say	Aldrich	1	Albany.
	T. inflecta	Say	Aldrich	2	Albany.
	T. tridentata	Say	Aldrich	20	Troy.
	T. do	Say	?	9	New York.
	T. fallax	Say	Lewis	6	Ohio.
	Mesodon albolabris	Say	Aldrich	2	Troy.
	M. do	Say	Lewis	6	Herkimer county.
	M. do	Say	Lewis	6	Hamilton county, Ohio (dark colored).

	M. exoleta	Binney	Lewis	7	Hamilton county, Ohio.
	M. multilineata	Say	Lewis	13	Ohio.
	M. elevata	Say	Lewis	7	Hamilton county, Ohio.
	M. thyroides	Say	?	5	New York.
	M. do	Say	Aldrich	2	New York.
	M. do	Say	Lewis	5	Hamilton county, Ohio.
	M. profunda	Say	Lewis	6	Hamilton county, Ohio.
	M. bucculenta	Gould	Aldrich	2	Newtown, L. I.
	M. diodonta	Say	Lewis	6	Hamilton county, Ohio.
	M. do	Say	?	1	New York.
	Vallonia pulchella	Müller	?	5	New York.
	V. do	Müller	Aldrich	30	Troy.
Cionella	Zua subcylindrica	Leach	Aldrich	5	Troy.
Pupa	Leuchochila contracta	Say	?	4	New York.
	L. corticaria	Say	?	2	New York.
Vertigo	Isthmia ovata	Say	?	2	New York.
Succin	Succinea ovalis	Gould	?	7	New York.
	S. do	Gould	Aldrich	10	Troy.
	S. avara	Say	?	2	New York.
	S. do	Say	Aldrich	18	Troy (large variety).
	S. obliqua	Say	?	5	New York (ovalis Say, not Gould).
	S. Totteniana	Lea	Aldrich	3	Orono, Maine.
Zonites	Omphalina fuliginosa	Griffiths.	Aldrich	2	Mohawk, N. Y.
	O. do	Griffiths.	Lewis	7	Hamilton county, N. Y.
	O. do	Griffiths.	?	2	New York.
	O. inornata	Say of Bin.	Lewis	7	Herkimer county, N. Y.
	O. Wardiana	Lea	Lewis	6	Hamilton Co., O. (*Z. ligerus*, Binney).
	O. ligera	Say of Lea	Lewis	6	Herk'r Co., N.Y. (*Z. intertextus*, Binney).
	O. cellaria	Müller	Newcomb	2	Massachusetts. [Ingalls).
	O. nitida	Müller	Aldrich	3	Cherry Valley, N. Y. (*H. hydrophila*,

LAND SHELLS OF THE NEW YORK STATE COLLECTION — (*Continued*).

Name.		Author.	Source.	No. of examp.	Locality, etc.
Genus.	Sub-genus. sp.				
	Omphalina nitida	Müller	?	5	New York.
	O. arborea	Say	Aldrich	15	Troy.
	O. viridula	Menke	Aldrich	2	Troy.
	Ventridens suppressa	Say	Aldrich		Pennsylvania.
	V. interna	Say	Aldrich	1	Albany.
	V. multidentata	Binney	Aldrich	1	Albany.
	Alexia myosotis	Drap	?	6	New York (coast).
	Carychium exiguum	Say	?	2	New York.
	Melampus bidentatus	Say	Aldrich	20	Staten Island, N. Y.
Limnaea	Limnaea stagnalis	Linn	?	4	Lake Michigan.
	L. do	Linn	?	6	Michigan (*appressa*, Say).
	L. do	Linn	Lewis	6	Swamp near Detroit.
	Radix columella	Say	?	1	New York.
	Limnophysa reflexa	Say	Newcomb	3	Ohio.
	L. do	Say	Aldrich	2	?
	L. elodes	Say	?	40	New York.
	L. do	Say	Aldrich	25	New York.
	L. do	Say	?	2	New York (young).
	L. desidiosa	Say	Newcomb	11	Ohio.
	L. do	Say	?	20	New Jersey.
	L. emarginata	Say	?	25	Grand Rapids, Michigan.
	L. catascopium	Say	Lewis	1	Erie Canal, N. Y. (amplified var.).
	L. do	Say	Lewis	5	Erie Canal, Mohawk, N. Y.

....	L. do	Say......	Aldrich	15	Mohawk River.
....	L. humilis........	Say......	Aldrich	6	Charleston, S. C.
....	L. do	Say......	Aldrich	15	Albany, N. Y. (var. parva, *Lea*).
....	Acella gracilis	Jay......	Buff.Soc.N.S	20	Niagara River, near Buffalo.
Physa	Physa ancillaria............	Say......	?..........	16	New York.
....	P. do var..........	Say......	?..........	20	New York.
....	P. do	Say......	Aldrich.....	11	Troy, N. Y.
....	P. do	Say......	?..........	6	New York.
....	P. heterostropha	Say......	?..........	50 ?	New York.
....	P. do	Say......	Aldrich	3	Albany, N. Y.
....	P. aurea ?...............	Lea......	?..........	9	New York.
....	P. cylindrica	DeKay...	?..........	1	Wood Creek, Wayne Co., N.Y. (TYPE).
....	Bulinus hypnorum	Linn.....	?..........	10	N. Y. (*Physa elongata*, Say. = *glabra*, DeKay).
Planorbis..	Planorbis lentus..........	Say......	?..........	8	?
....	P. do	Say......	?..........	7	New York.
....	Planorbella campanulata.....	Say	?..........	7	New York.
....	Helisoma corpulenta	Say......	?..........	3	New York (var. of trivolvis, *Say*).
....	H. trivolvis	Say......	?..........	12	?
....	H. do	Say......	?..........	30	New Jersey.
....	H. do	Say......	Aldrich	10	Troy, N. Y.
	Pectibranchiata.				
....	Valvata tricarinata..........	Say......	?..........	40	New York.
....	V. do	Say......	Aldrich	30	Erie Canal, Mohawk, N. Y.
Vivipara ..	Vivipara contectoides	Binney...	Lewis......	6	Erie Canal, Mohawk, N. Y.
....	Melantho decisa	Say......	?..........	7	New York (apex croded).
....	M. do	Say......	Aldrich	5	Erie Canal, Mohawk, N. Y.
....	M integer............	Say......	Lewis......	7	Do..................(amplified var.).
....	M. do	Say......	Lewis......	7	Do.................. (gibbous var.).
....	M. do	Say......	Aldrich	1	Do.................. (sinistral).

LAND SHELLS OF THE NEW YORK STATE COLLECTION — (*Continued*).

Name.		Author.	Source.	No. of examp.	Locality, etc.
Genus.	Sub-genus. sp.				
	Melantho integer	Say	Lewis	2	Erie Canal, Mohawk, N. Y. (sinistral).
	M. rufus	Hald.	Lewis	7	Erie Canal, Mohawk, N. Y.
	Bythinella obtusa	Lea	Aldrich	20	Do.
	Gillia altilis	Lea	Aldrich	50	Troy, N. Y.
	Somatogyrus subglobosus	Say	Aldrich	25	Erie Canal, Mohawk, N. Y. (*Pal. subglobosa*, Say. *Mel. isogona*, Say).
	Amnicola porata	Say	?	25	New York (*A. pallida*, Hald.).
	A. Cincinnatiensis	Anthony	Aldrich	25	Erie Canal, Mohawk, N. Y.
	A. do	Anthony	?	2	New York.
	A. lustrica	Say	?	1	New York.
	Trypanostoma subulare	Lea	Aldrich	4	Mohawk River.
	T. do	Lea	?	6	Erie Canal.
	Goniobasis livescens	Menke	Anthony	5	Niagara River.
	G. do	Menke	Aldrich	10	Canal at Troy.
	G. do	Menke	?	2	Erie Canal.
	G. Virginicum	Gmel	?	2	Hudson River.
	G. do	Gmel	Lewis	25	Erie Canal, Mohawk, N. Y.
	G. do	Gmel	Aldrich	9	Erie Canal, Mohawk, N. Y.
	Anculosa carinata	Brug	?	3	Susquehanna River.

Seventy-six species are contained in the above collection, represented in eleven hundred and seventeen examples.

CORBICULADÆ OF THE NEW YORK STATE COLLECTION.*

Specie number.	Name.	Author.	Source.	No. of examp.	Locality, etc.
50	Sphaerium simile	Say	Lewis	3	Herkimer, N. Y.
50	S. do	Say	Lewis	3	Schuyler's Lake, N. Y.
54	S. stratinum	Lam	?	3	N. Y. (*Cyclas edentula* Say).
54	S. do	Lam	Aldrich	23	Mohawk River, Herkimer Co., N. Y.
54	S. do	Lam	?	5	N. Y.
56	S. rhomboideum	Say	Lewis	3	? Cambridge, Mass
56	S. do	Say	Lewis	5	? Columbus, Ohio.
58	S. fabale	Prime	Lewis	10	Headwaters of the Unadilla River, N. Y.
59	S. occidentale	Prime	Lewis	9	Herkimer Co., N. Y.
68	S. partumeium	Say	?	4	"N. Y." (? Massachusetts).
68	S. do	Say.	Aldrich	3	Newark, N. J.
71	S. transversum	Say.	Lewis	8	Canal at Mohawk, N. Y.
73	S. secure	Prime	?	8	N. Y.
74	S. rosaceum	Prime	Lewis	7	Ditch at Mohawk, N. Y.
76	S. truncatum	Linsley	Lewis	4	"N. Y." (probably Massachusetts).
94	Pisidium virginicum	Bourg	Lewis	8	Mohawk River (*Cyclas dubia* Say).
96	P æquilaterale	Prime	Aldrich	25	Erie Canal, Mohawk, N. Y.
97	P compressum	Prime	Lewis	17	N. Y.
97	P. compressum v. altile Anth	Prime	Lewis	25	Erie Canal, Mohawk, N. Y.
97	P. compressum	Prime	Aldrich	25	Erie Canal, Mohawk, N. Y.
98	P. variabile	Prime	Newcomb	8	Massachusetts.
100	P. abditum	Hald.	Lewis	7	N. Y.
105	P. ferruginium	Prime	Lewis	12	"N. Y." (? Massachusetts).
106	P. ventricosum	Prime	Lewis	4	"N. Y." (? Massachusetts).

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*Catalogued by Dr. James Lewis, 1875.

LAND SHELLS OF THE UNITED STATES.

	Name.	Author.	Source.	No. of examp.	Locality, etc.
	Glandina truncata	Say	Lewis	4	Mantanzas River Marshes, Florida.
	G. do	Say	Anthony	1	Florida.
	Macrocyclis concava	Say	Aldrich	2	Pennsylvania.
	M. do	Say	?	5	New York.
Patula	Helix solitaria	Say	Newcomb	3	Ohio.
Patula	H. alternata	Say	Aldrich	1	East Tennessee.
Patula	H. do	Say	Lewis	6	Monroe Co., Tenn.
Patula	H. do	Say	?	6	New York.
Patula	H. perspectiva	Say	?	8	?
Patula	H. do	Say	Lewis	16	Monroe Co., Tenn.
Polygyra	H. auriculata	Say	Newcomb	1	Florida.
Polygyra	H. do	Say	Hubbard	4	Fort George Island, Florida.
Polygyra	H. Postelliana	Bland	Hubbard	4	Baldwin, Florida.
Polygyra	H. Jacksonii	Bland	Hubbard	4	Fort Gibson, Indian Terr.
Polygyra	H. plicata	Say	Lewis	7	Monroe Co., Tenn. (*H. Hazardi*, Bland).
Polygyra	H. do	Say	Newcomb	4	Alabama.
Polygyra	H. Dorfeuillana	Lea	Hubbard	5	Fort Gibson, Indian Terr.
Polygyra	H. septemvolva	Say	Hubbard	4	Enterprise, Florida.
Polygyra	H. do	Say	Lewis	35	St. Augustine, Florida (W. G. Binney).
Polygyra	H. volvoxis	Parreyss	Hubbard	8	Jacksonville, Florida.
Polygyra	H. pustula	Ferussac	Hubbard	5	Jacksonville, Florida.
Polygyra	H. leporina	Gould	Hubbard	3	Fort Gibson, Indian Terr.
Stenotrema	H. spinosa	Lea	Newcomb	2	Tennessee.
Stenotrema	H. do	Lea	Hubbard	2	Chattanooga, Tenn.

Stenotrema	H.	barbigera	Redfied	Lewis	4	Clay Co., N. C. (Miss A. E. Law).
Stenotrema	H.	stenotrema.	Fer	Newcomb	2	Alabama.
Stenotrema	H.	do	Fer	Aldrich	7	Tennessee.
Stenotrema	H.	monodon var. cincta	Rackett	Lewis	4	Clay Co., N. C. (Miss A. E. Law).
Tridopsis	H.	palliata	Say	Lewis	3	Hamilton Co., Ohio.
Tridopsis	H.	do	Say	Aldrich	1	Ohio.
Tridopsis	H.	do	Say	?	3	? (one deformed specimen).
Tridopsis	H.	appressa	Say	Newcomb	3	Kentucky.
Tridopsis	H.	do	Say	Aldrich	3	Alabama.
Tridopsis	H.	do	Say	Newcomb	6	Alabama.
Tridopsis	H.	inflecta	Say	Newcomb	2	Ohio.
Tridopsis	H.	Rugeli	Shuttlw'h	Aldrich	2	Tennessee.
Tridopsis	H.	do	Shuttlw'h	Newcomb	5	Alabama.
Tridopsis	H.	tridentata	Say	Aldrich	6	Troy, N. Y.
Tridopsis	H.	do	Say	?	2	Ohio ?
Tridopsis	H.	do	Say	?	10	New York.
Tridopsis	H.	falax	Say	Aldrich	4	Tennessee.
Tridopsis	H.	do	Say	Newcomb	3	Ohio.
Tridopsis	H.	do	Say	Lewis	6	Hamilton Co., Ohio.
Tridopsis	H.	Hopetonensis	Shuttlw'h	Hubbard	4	Charleston, S. C.
Mesodon	H.	albolabris	Say	?	3	New York.
Mesodon	H.	do	Say	Aldrich	4	Silver Spring, Pa.
Mesodon	H.	multilineata	Say	Aldrich	2	Ohio.
Mesodon	H.	do	Say	Newcomb	1	Ohio.
Mesodon	H.	Pennsylvanica	Green	Lewis.	5	Hamilton Co., N. Y.
Mesodon	H.	do	Green	Aldrich	1	Ohio.
Mesodon	H.	Mitchelliana	Lea	Lewis	6	Hamilton Co., N. Y.
Mesodon	H.	do	Lea	Newcomb	2	Alabama.
Mesodon	H.	do	Lea	Aldrich	1	Ohio.
Mesodon	H.	elevata	Say	Newcomb	2	Ohio.
Mesodon	H.	do	Say	Aldrich	2	Monroe Co., Tenn.

LAND SHELLS OF THE UNITED STATES — (*Continued*).

	Name.	Author.	Source.	No. of examp.	Locality, etc.
Mesodon	Helix elevata	Say	Lewis	3	Monroe Co., Tenn., (banded var).
Mesodon	H. Clarkii	Lea	Lewis	5	Clay Co., N. C. (Miss A. E. Law).
Mesodon	H. exoleta	Binney	Newcomb	3	Ohio.
Mesodon	H. do	Binney	Aldrich	1	Ohio.
Mesodon	H. do	Binney	Newcomb	4	Alabama.
Mesodon	H. Wheatleyi	Bland	Lewis	3	Clay Co., N. C. (Miss A. E. Law).
Mesodon	H. thyroides	Say	?	2	?
Mesodon	H. clausa	Say	Newcomb	4	Georgia.
Mesodon	H. do	Say	Aldrich	3	Ohio
Mesodon	H. do	Say	Lewis	6	Hamilton Co., Ohio.
Mesodon	H. profunda	Say	Newcomb	3	Ohio.
Mesodon	H. do	Say	Aldrich.	2	Ohio.
Mesodon	H. diodonta	Say	?	2	? (Helix sayii, Binney).
Vallonia	H. pulchella	Müller	Hubbard	6	Fort Gibson, Ind. Ter. *H. minata*, Say.)
Arionta	H. Californiensis	Lea	Lewis	3	Monterey, Cal.
Tachea	H. hortensis	Müller	Aldrich	1	Maine.
Pomatia	H. aspersa	Müller	Ingalls	2	France (colonized in the United States).
Bulimulus	H. dealbatus	Say	Newcomb	14	Alabama.
Omphalina	Zenites fuliginosa	Griffith	Newcomb	1	Alabama.
Omphalina	Z. lævigata	Pfeiffer	Lewis.	5	Monroe Co., Tenn. (Miss A. E. Law).
Omphalina	Z. do	Pfeiffer	Aldrich	1	Tennessee.
Omphalina	Z. inornata, Say	(of Bin'y.)	?	1	New York.
Omphalina	Z. acerra	Lewis	Lewis	6	Monroe Co., Tenn. (Miss A. E. Law).
Omphalina	Z. ligera, Say	(of Lea)	Aldrich	1	Albany N. Y. (*Z. intertextus* Binney and Bland.
Omphalina	Z. Wardiana	Lea	Newcomb	2	Ohio (*Z. ligerus*, Say of Binney).

Omphalina	Z. cerinodia	Anth	Hubbard	2	Charleston, S. C.
Omphalina	Z. capsella	Gould	Aldrich	2	Monroe Co., Tenn.
Omphalina	Z. do	Gould	Lewis	10	Monroe Co., Tenn.
Ventridens	Z. lasmodon	Phillips	Lewis	6	Monroe Co., Tenn.
Ventridens	Z. gularis	Say	Aldrich	3	East Tennessee.
Ventridens	Z. do	Say	Lewis	32	Monroe Co., Tenn.
Ventridens	Z. interna	Say	Hubbard	5	Chattanooga, Tenn.
	Vivipara contectoides	W. G. Bin.	Newcomb	3	Alabama.
	V. do	W. G. Bin.	?	23	?
	V. Georgiana	Lea	?	2	Georgia.
	V. subpurpurea	Say	Anthony	3	Ohio.
	Tulotoma limonolifera	Lea	Newcomb	1	Coosa River, Ala. (*Pal. magnifica*, Con).
	T. do	Lea	Lewis	6	Coosa River, Ala. (young, *Pal. angulata* [of Lea).
	Melantho decisus	Say	?	6	New York.
	M. do	Say	Lewis	3	Schuyler's Lake, N. Y.
	M. do	Say	Aldrich	15	Newark, N. J.
	M. rufus	Held	Aldrich	3	Troy, N. Y.
	M. ponderosus	Say	Aldrich	8	Alabama River (var. *Nolani*, Tryon).
	M. do	Say	Anthony	2	Ohio River (*Pal. regularis*, Lea).
	M. do	Say	Newcomb	3	Ohio River.
	M. integer	Say	?	3	Canal, N. Y.
	M. do	Say	Aldrich	15	Erie Canal, N. Y.
Oligra	Helicina orbiculata	Say	Newcomb	9	Alabama.
Oligra	H. do	Say	Newcomb	14	Texas.

Sixty-two species, in five hundred and twelve examples, are contained in the above collection.

LIST OF SHELLS PRESENTED TO THE STATE MUSEUM BY DR. JAMES LEWIS, MARCH 15, 1875.

Name.	Author.	No. of examp.	Serial number.	Locality, etc.
Nassa vibex var.	Say	6		Florida.
N. do	Say	6		Egmont Key, Florida.
Neritana reclivata	Say	8		Tampa, Florida.
Vitrina limpida	Gould	8		Litchfield, Herkimer County, N. Y.
Helix Californiensis	Lea	3		Monterey, Cal.
Polygyra (Helix) Carpenteriana	Bland	5		Egmont Key, Florida.
Macroceramus Gossei	Pfeiff	3		Sarosota, Florida.
Punctum (Helix) minutissimum	Lea	4		Litchfield, N. Y.
Succinea rusticana	Gould	5		Clear Lake, California.
S. campestris	Say	9		St. Augustine, Florida.
Ventridens (Zonites) multidentata	Binney	5		Litchfield, N. Y.
Omphalina (Z.) Elliotti	Redfield	5		Mountains of Western North Carolina.
O. (Z.) sculptilis	Bland	3		Mountains of East Tennessee.
Melampus coffeus	Linn	5		Cedar Keys, Florida.
Limnæa columella	Say	4		Blount County, Tennessee.
Limnophysa emarginata	Say	2		Lake Higgins, Michigan.
*L. do ?	Say	2		Lake Houghton, Michigan.
Physa Hildrethiana	Lea	5		Canton, Illinois.
P. costata	Newcomb	3		Clear Lake, California.
P. Lordi	Baird	2		Lake Houghton, Michigan.
†Bulinus hypnorum	Drap	6		Sandlake, N. Y. (*Physa elongata*, Say).
B. do	Drap	26		Canton, Illinois.
Planorbis glabratus ?	Say	4		Davenport, Iowa.
Helisoma (Planorbis) bicarinata	Say	27		Cedar Lake, Litchfield County, N. Y.

Menetus (Planorbis) exacutus	Say	3	......	Little Lakes, Herkimer County, N. Y.
Ancylus diaphanus	Haldeman	14	......	Ohio River.
A. fuscus	Adams	3	......	Little Lakes, Herkimer County, N. Y.
A. tardus	Say	11	......	Mohawk River, Mohawk, N. Y.
A. parallelus	Hald	3	......	Little Lakes, Herkimer County, N. Y.
Valvata virens	Tryon	4	......	Clear Lake, California.
Melantho ponderosus	Say	7	......	Wabash River, Indiana.
Bythinella Nickliniana	Lea	18	......	*Bellefonte, Pennsylvania.
B. obtusa	Lea	8	......	Mohawk River, Mohawk, N. Y.
B. Binneyi	Tryon	20	......	California.
B. tenuipes?	Hald	7	......	Jacksonville, Florida.
Gillia altilis	Lea	15	......	Schuylkill River, Phœnixville, Pennsylvania.
Amincola lustrica	Say	8	......	Little Lakes, Herkimer County, N. Y.
A. do	Say	4	......	Erie Canal, Mohawk, N. Y., 1867.
Fulminicola seminalis	Hinds	7	......	California.
‡Pomatiopsis Cincinnatiensis	Lea	3	......	Illinois.
P. lapidaria	Say	7	......	Illinois.
P. Cincinnatiensis	Lea	5	......	Columbus, Ohio.
Littorina irrorata	Say	3	......	Hog Island, Virginia.
L. do	Say	5	......	Fernandina, Florida.
L. angulifera	Lam	4	......	Cedar Keys, Florida.
Truncatella Californica	Pfeif	7	......	San Diego, California.
Melanopsis prærosa	Linn	4	......	Syria.
Cerithidea scalariformis	Say	5	......	Cedar Keys, Florida.
Trypanostoma alveare	Conrad	4	1	Wabash River, Indiana.
T. undulatum	Say	4	3	Wabash River, Indiana.
T. do	Say	3	....	East Fork of White River, Indiana.
§T. nodosum	Say	2	5	Chattanooga, Tennessee.
‖T. nobile	Lea	2	6	Tennessee River, Alabama.

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*L. ampla, Mighels, var.

† *Physa elongata*, Say. *Physa glabra*, De Kay.

‡ *Amnicola Sayana* of Anthony and Binney.

§ *Io nodosa*, Lea.

‖ *Io nobilis*, Lea.

LIST OF SHELLS PRESENTED TO THE STATE MUSEUM BY DR. JAMES LEWIS — (*Continued*).

Name.	Author.	No. of examp.	Serial number.	Locality, etc.
Trypanostoma robustum	Lea	2	7	Holston River, Tennessee.
T. canaliculatum	Say	5	8	Ohio River.
T. filum	Lea	3	9	Tennessee River, Alabama.
T. Troostii	Lea	2	11	Wabash River, Maryland.
T. affine	Lea	3	12	Little Tennessee River, Monroe Co., Tenn.
T. Pybasii var	Lea	3	14	Chota Shoals, Holston River, Tennessee.
T. incurvum	Lea	4	20	Tennessee River, Alabama.
T. Anthonyi	Lea	3	24	Little Tennessee River, Monroe Co., Tenn.
T. prasinatum		4	25	Coosa River, Alabama.
T. Lewisii		5	32	Illinois River, Peoria, Illinois.
T. Christyi		3	54	Wolf Creek, Blount County, Tennessee.
T. Estabrookii		4	73	Tan Yard Branch, Monroe County, Tenn.
T. modestum		4	74	Chelogarty Creek, Blount County, Tenn.
*T pumilum		4	80	Licking River, Kentucky.
†T. conicum var		5	......	Licking River, Kentucky.
T. do		2	......	Falls of the Ohio.
Angitrema armigera		3	......	Cumberland River, Tennessee.
A. do		2	......	Wabash River, Indiana.
Strephobasis plena	Anthony	3	......	Tennessee River, Alabama.
Eurycœlon gibbosa	Lea	2	.....	Alabama River.
Goniobasis plicifera	Lea	4	97	Portland, Oregon.
G. clavæformis	Lea	6	172	Eckel's Branch, Jefferson County, Tenn.
G. do	Lea	12	172	Monroe County, Tenn.
G. do	Lea	4	172	Wilson's Creek Outlet, Monroe County, Tenn.

G. Troostiana var.	Lea	5	194	Dougherty's Spring, Monroe County, Tenn.
G. rubicunda	Lea	4	221	Coosa River, Alabama.
G. Coosaensis	Lea	4	220	Coosa River, Alabama.
G. læta	Jay	2	227	Coosa River, Alabama.
G. porrecta	Lea	4	196	McClelland's Spring, Monroe County, Tenn.
G. pulchella	Anthony	7	153	Illinois River.
G. Potosiensis	Lea	6	146	Missouri.
‡G. simplex	Say	12	......	Turkey Creek, Knox County, Tenn.
Anculosa prærosa var.	Say	11	13	Chota Shoals, Holston River, Tenn.
A. do	Say	6	15	Ohio River.
§A. Troostiana ?	Say	4	......	Little Tennessee River, Tenn.
Unio Pybasii	Lea	1	441	Conasauga Creek, Monroe County, Tenn.
U. Tellicosnsis	Lea.	1	.....	Tellico River, Tennessee.
U. Holstonensis	Lea	1	251	Little Tennessee River, Tennessee.
U. appressus	Lea	1	......	Clinch River, Anderson County, Tenn.
Anodonta angulata	Lea	1	1032	Idaho.
A. Wahlamatensis	Lea	1	897	Clear Lake, California.
Donax variabilis	Say	4	......	Egmont Key, Florida.
‖Gouldia lunulata	(Conr.)	3	......	Egmont Key, Florida.
Plicatula ramosa.	Lam	3	......	Egmont Key, Florida.

Eighty-seven species, and five hundred and twenty examples in the above list.

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* *Mel. conica*, Say. † *Trypanostoma pumilum*, Lea. ‡ *Goniobasis gramonæ*, Hald. § *Anculosa Tryoni*, Lewis. ‖ *Astarte lunulata*, Conr.

The following species were also presented by Dr. Lewis during the same year ;

Glandina truncata, *Say*	Marshes nr. Matansas Riv., Fla.
Macrocyclis concava, *Say*	Hamilton Co., Ohio.
Helix (Patula) solitaria, *Say*	Hamilton Co., Ohio.
H. (P.) alternata, *Say*	Monroe Co., Tenn.
H. (P.) perspectiva, *Say*	Monroe Co., Tenn.
H. (Polygyra) plicata, *Say*	Monroe Co., Tenn.
H. (P.) semtemvolva, *Say*	Moat & Fort, St. August., Fla.
H. (Stenotrema) barbigera, *Redfield*	Clay Co., N. Car.
H. (S.) monodon, *Rackett.*	Clay Co., N. Car.
H. (S.) monodon, *Rackett.*	Herkimer Co., N. Y.
H. (Tridopsis) palliata, *Say*	Hamilton Co., Ohio.
H. (T.) appressa, *Say*	Hamilton Co., Ohio.
H. (T.) tridentata, *Say*	Hamilton Co., Ohio.
H. (T.) fallax, *Say*	Hamilton Co., Ohio.
H. (Mesodon) albolabris, *Say.*	Hamilton Co., Ohio.
H. (M.) Pennsylvanica, *Green*	Hamilton Co., Ohio.
H. (M.) Mitchelliana, *Lea*	Hamilton Co., Ohio.
H. (M.) Mitchelliana, *Lea*	Herkimer Co., N. Y.
H. (M.) elevata, *Say*	Hamilton Co., Ohio.
H. (M.) elevata (banded)	Monroe Co., Tenn.
H. (M.) Clarkii, *Lea*	Clay Co., N. Car.
H. (M.) exoleta, *Binney*	Hamilton Co., Ohio.
H. (M.) Wheatleyi, *Bland*	Clay Co., N. Car.
H. (M.) thyroides, *Say*	Hamilton Co., Ohio.
H. (M.) clausa, *Say*	Hamilton Co., Ohio.
H. (M.) profunda, *Say*	Hamilton Co., Ohio.
H. (M.) diodonta, *Say* = Sayi, Binney	Herkimer Co., N. Y.
Zonites (Omphalina) fuliginosa, *Greff.*	Hamilton Co., Ohio.
Z. (O.) lævigata, *Pfeiff.*	Monroe Co., Tenn.
Z. (O.) inornata, *Say*	Herkimer Co., N. Y.
Z. (O.) capsella, *Gould* ?	Monroe Co., Tenn.
Z. (O.) ligera, *Say* of Lea	Herkimer Co., N. Y.
Z. (O.) Wardiana, *Lea*	Hamilton Co., Ohio.
Z. (O.) acerra, *Lewis*	Monroe Co., Tenn.
Z. (Ventridens) gularis, *Say*	Monroe Co., Tenn.
Z. (V.) lasmodon, *Phil.*	Monroe Co., Tenn.
Limnæa stagnalis, *Linn*	Swamp near Detroit, Mich.
Vivipara contectoides, *W. G. Binney.*	Erie Can., Mohawk, N. Y.(col.)
Melantho integer, *DeKay* (gibbous vr.)	Erie Canal, Herkimer, N. Y.
M. integer, *DeKay* (amplified vr.)	Erie Canal, Herk. Co., N. Y.
M. rufus, *Hald*	Erie Canal, Herk. Co., N. Y.
Anculosa ligata, *Anth*	Holston River, Tenn.
A. vittata, *Lea*	Holston River, Tenn.
A. Troostiana, *Lea*	Holston River, Tenn.
A. subglobosa, *Say* var	Aleram's Cr'k, Blount Co.,Ten.
A. tintinnabulum, *Lea*	Holston River, Tenn.
A. costata, *Anth*	Ohio River.
Eurycœlon crassa, *Hald*	Chota Shoals, Holston R.,Ten.

Goniobasis interrupta, *Hald*	Conasauga Riv., Mon. Co., Ten.
Pleurocera Estabrookii, *Lea*	Creek in Monroe Co., Tenn.
Strephobasis Clarkii, *Lea*	Holston River, Tenn.
S. Lyonii, *Lea*	Holston River, Tenn.
Tulotoma bimonilifera, *Lea* (young)	Coosa River, Tenn.
Lithasia obovata, *Say*	Falls of the Ohio.
L. obovata, *Say*	Eagle Creek, Ky.
Angitrema verrucosa, *Rob*	Wabash, Ind.
A. verrucosa, *Rob*	Broad River, Tenn.
Io turrita, *Anth*	Clinch R., Anderson Co., Tenn.
I. spinosa, *Lea*	Clinch R., Anderson Co., Tenn.
I. brevis, *Anth*	Holston River, Knox Co., Tenn.
Unio Conasaugaensis, *Lea*	Conasauga C'k, Mon. Co., Tenn.
U. Pybasii, *Lea*	Creeks of Monroe Co., Tenn.
U. Tappannianus, *Lea*	Erie Canal, Mohawk, N. Y.
U. caperatus, *Lea*	Clinch River, Tenn.
U. Savannahensis, *Lea*	Savannah River.
U. Forbesianus, *Lea*	Savannah River.
U. Osbeckii, *Phil*	Fuh Shan, China.
U. camptodon, *Say*	Ohio.
U. Tuscumbiensis, *Lea*	Poplar Creek, Roane Co., Tenn.
U. Vescoi, *Bourg*	River Tigris, Assyria.
Margaritana Holstonia, *Lea*	Creeks of Monroe Co., Tenn.
M. undulata, *Say*	Beaver Creek, Warren, N. Y.
Monocondylæa Mardinensis, *Lea*	River Tigris, Assyria.
Anodonta lacustris, *Lea*	Beaver Creek, Warren, N. Y.
A. lacustris, *Lea* var	Cedar Lake, Herk. Co., N. Y.
A. Lewisii, *Lea*	Erie Canal, Herk. Co., N. Y.
A. subcylindracea, *Lea*	Erie Canal, Herk. Co., N. Y.

APPENDIX F.

Statistics relating to the New York State Museum of Natural History, as compiled from the report made to the Tenth Census of the United States.

January 4, 1882.

COLLECTIONS.

	Entries.	No. specimens.
Archæology and ethnology	1,940	1,940
Geology and palæontology	9,233	21,789+
Mineralogy (300 species)	2,000	3,500+
Translucent sections of rocks and fossils	1,000	3,000
Arranged collections in geology and palæontology not on exhibition, estimated	8,000	*30,000
Duplicate collections in geology and palæontology	......	270,000
Botany	8,821	31,000
Vertebrates	1,000	4,362
Insects	376	2,642
Mollusca	7,000	85,000
Other invertebrates	200	710
Grand total	39,570	453,643+

ESTIMATED VALUE OF THE COLLECTIONS.

Botany — cryptogamous		
phænogamous		$20,100
Zoölogy — mammals	$1,073	
birds	5,675	
fishes and reptiles, alcoholic	550	
fishes and reptiles, stuffed	250	
insects, Fitch collection†	100	
insects, J. A. L. pinned specimens	186	
insects, J. A. L. larvæ, etc	85	
insects, old museum collections	50	
mollusks	9,700	
other invertebrates	210	
		17,879

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*To be added in the future arrangement of the collections.

†Arranged by Dr. Fitch in 1850, containing fifty-four species and five sub-species of types, in two hundred and twenty-five examples.

Geology	$5,000
Palæontology	70,000
Translucent sections of rocks and fossils	6,000
Duplicate material	20,000
Mineralogy	4,000
Library	1,500
Grand total	$144,479

NOTICE OF THE MACHINERY AND METHODS OF

CUTTING SPECIMENS OF ROCKS AND FOSSILS

AT THE

NEW YORK STATE MUSEUM OF NATURAL HISTORY.

By James W. Hall.

The cutting of sections of rock and fossils has become so important an adjunct to geological study, that any device or invention by which such work is facilitated is worthy of attention. The work of cutting fossils was begun in the New York State Museum with very inadequate means. A foot-lathe, turning a vertical disc of tin, with the specimen held in one or both hands as the case required, was a step in advance of the first method adopted. But the labor of running a lathe by human power became a serious obstacle when large specimens were to be cut, and after some delay an experiment was made with a small steam engine, which was afterward replaced by another one better adapted for the work, and run by the steam from a small upright boiler, which occupies no more space in the room than an ordinary cylinder stove.

Following this adaptation for working, came the efforts at improvement in the method of holding the specimens and presenting them to the cutting disc. After numerous trials and the application of several devices, the experiment resulted in the selection of the apparatus represented on Plate 2.

This consists of a horizontally revolving tin disc in the centre, and vertical standard at the back of the table, to which is affixed a strong arm or lever. This lever is capable of being revolved by loosening screws at its connection with the socket which slides on the vertical standard. To this arm or lever are adapted strong vise jaws, which slide backward and forward upon the arm, and are capable of being fixed in any required position by a set-screw. The specimen to be cut is placed between these jaws, the screws firmly tightened, and by a graduated thumb-screw the line on which the specimen is to be cut is brought opposite to the edge of the disc. The outer end of the lever is then taken in the left hand of the operator and brought forward toward the disc and the cutting begun, the force of the hand modifying the degree of pressure and rate of cutting. When a specimen is placed in the vise jaws, and several slices or sections are desired, the arm can be lowered or raised by the graduated screw, shown at FF., on the side of the vertical standard. In this way any required number of slices can be cut from the same specimen, or the whole specimen cut into sections as may be required. This is shown in the figure of the specimen attached to the lever. When a series of slices have been cut to the depth required, the arm may be turned a quarter revolution, by loosening a screw at the junction of the lever and sliding socket, and the slices all cut through, leaving the residue of the specimen still remaining in the vise.

This process is perfectly adapted to all strong and solid specimens; but specimens required for cutting are not always in that condition, and to provide for such as are not firm enough to endure the pressure, a small disc, with ball and socket joint, has been devised, and the specimen is cemented to this disc. The socket is closed by a hinge and presents a square block of metal which is placed in the disc jaws; the disc is adapted to the position required and firmly clasped, and thus held while the specimen is being cut.

For the cutting of large specimens, when the diameter is greater than the semi-diameter of the disc, another adaptation has been devised by which the object is perfectly accomplished.

The machinery used in this work for the Museum has gradually come into its present condition only after patient trial and experiment; new parts being invented as the necessity for them became apparent.

The calcareous fossils are cut by a horizontal disc of tin, which moves at the rate of five hundred revolutions per minute; and is fed with emery and water. The disc which is used to cut silicious rocks, such as flint, hornstone, etc., is made of soft copper "seasoned" with diamond dust, and runs in a trough of oil at about one hundred revolutions per minute. The various attachments for holding the specimens firmly in any required position are all from original designs.

The following illustrations will explain the descriptions given above:

Plate 2, *fig*. 1.—A A. Perpendicular cylindrical steel rod supported between two centers, K K, allowing a rotary motion without departing from the perpendicular position.

B B. Horizontal square steel rod or arm, with one end turned cylindrical, fitting in socket, which slides upon rod A A, which gives rod B B also a rotary motion, by which means the specimen, after being clamped in the jaws D D, may be set at any required angle for cutting.

F F. Long screw resting on shoulder at upper cut of A A, by the use of which the long arm B B may be adjusted in any position upon the rod A A.

D D. Vise jaws sliding upon arm B B, and holding specimen to be cut.

C C. Rod passing through jaws D D. Thread and nut for fine adjustment; rachet and catch at the long end c c for quicker manipulation or coarse adjustment.

E P. Rachet and pinion attachable to jaw at Q and arm at R, by which specimens too large to be cut by one sweep against cutting wheel may be passed horizontally along the square arm B B, and so produce a continuous cut upon one plane to any required length.

O O. Iron frame holding the apparatus.

G. Cutting disc of iron, steel, tin or copper, of any desirable thickness; the diameter I generally use is from six to twelve inches.

H. Mandril supporting cutting disc, about twelve inches above the table, resting in bearing run by a cone pulley, corresponding to one upon main shaft, by which the rapidity of the revolutions of the cutting wheel may be raised as required.

A specimen from which sections have been taken, showing the saw-marks upon its surface, is represented between jaws D D.

Plate 1, *fig.* 1.—Holder with ball and socket joint, so arranged as to fit into the jaws on the horizontal arm of the crane, plate 2, and by means of which small specimens cemented upon face-plate C may be adjusted to any required angle for cutting.

A A. Jaws with concave surfaces, in which the spherical end of holder B fits accurately.

B. Holder upon which a circular face-plate C may be attached at screw D.

C C C. Circular plates upon the faces of which small specimens of rocks or fossils may be cemented, and afterward adjusted to any required angle for cutting.

S. A specimen cemented upon face-plate C ready to be placed upon holder B for cutting.

Plate 1, *fig.* 2.—Horizontal turn-table upon which a specimen to be cut is clamped.

A. Square cast-iron base or socket, which is held in jaws of horizontal arm B B, plate 2.

B. Circular table revolving horizontally upon base A, and manipulated by gearing at C.

The advantage gained by this attachment is, that by constantly presenting to the cutting wheel new surfaces of the specimen upon the same plane, the capacity is doubled, viz.: by this means a wheel cutting in a direct line to the depth of only six inches may be made to cut through a fossil or rock specimen of twelve inches in diameter by the revolution of the turn-table.

REPORT OF THE BOTANIST.

Hon. DAVID MURRAY, LL. D.,
Secretary of the Board of Regents of the University:

SIR — Since the date of my last report, specimens of two hundred and forty-eight species of plants have been mounted and placed in the State Herbarium, of which ninety-four species were previously unrepresented therein. The others represent species by improved specimens, or are forms or varieties not before represented. A list of the names is marked (1).

During the past season specimens have been collected in the counties of Albany, Greene, Putnam and Rensselaer. These represent one hundred and fifteen species, of which sixty-seven are new to the State and to the Herbarium, and forty are believed to be unpublished. A list of the names of the collected specimens is marked (2).

Among the contributed specimens, only one collected in the State proves to be new to our flora. A list of the names of contributors and their contributions is marked (3).

A record of the species now added to our flora and of the descriptions of such as are yet unpublished is marked (4).

A part of the report containing remarks and observations upon various species and a list of the New York Carices at present known is marked (5).

In pursuance of the plan introduced in the Thirty-third Report, in reference to the subgenus Amanita, and for the reasons therein stated, descriptions of all the hitherto known New York species of Agarics belonging to the subgenus Lepiota have been drawn up, and, in many instances, made more complete by the addition of the dimensions and character of the spores. Full remarks concerning the peculiarities, variations and distinctive features of each species are added to its description, and important characters are italicized. A synoptical table is introduced, which is intended to aid in tracing any given species to its name. This monograph of our Lepiotæ is marked (6).

A table case has been filled with specimens of earth-stars (Geaster), puff-balls (Lycoperdon and Bovista) and sap-balls (Polyporus) placed in paper trays. All of our fleshy and tough or corky species of fungi ought to be exhibited in this manner. Many are too bulky to be mounted entire in the usual manner, and many are in better condition for study and recognition if preserved in their natural shape than if pressed and mounted on herbarium sheets and stacked away in cabinets.

(1.)

PLANTS MOUNTED.

Species not new to the Herbarium.

Clematis verticillaris, *DC.*
Thalictrum anemonoides, *Mx.*
Ranunculus Pennsylvanicus, *L.*
Nymphæa odorata, *Ait.*
Nuphar advena, *Ait.*
N. Kalmiana, *Ait.*
Cardamine hirsuta, *L.*
Sisymbrium officinale, *Scop.*
Raphanus sativus, *L.*
Lepidium ruderale, *L.*
Malva rotundifolia, *L.*
Vitis æstivalis, *Mx.*
Acer Pennsylvanicum, *L.*
Robinia viscosa, *Vent.*
Rubus odoratus, *L.*
R. villosus, *Ait.*
Rosa Carolina, *L.*
R. lucida, *Ehrh.*
Ribes hirtellum, *Mx.*
R. prostratum, *L'Her.*
Epilobium angustifolium, *L.*
E. coloratum, *Muhl.*
Aralia hispida, *Mx.*
Sambucus pubens, *Mx.*
Viburnum nudum, *L.*
Galium verum, *L.*
Aster corymbosus, *Ait.*
A. cordifolius, *L.*
A. multiflorus, *Ait.*
A. Tradescanti, *L.*
A. longifolius, *Lam.*
A. puniceus, *L.*
Solidago latifolia, *L.*
S. stricta, *Ait.*
S. serotina, *Ait.*
Bidens connata, *Muhl.*
B. cernua, *L.*
Artemisia Canadensis, *Mx.*
Lactuca Canadensis, *L.*
Campanula rotundifolia, *L.*
Plantago major, *L.*
Verbascum Blattaria, *L.*
Mimulus ringens, *L.*
Mentha Canadensis, *L.*
M. piperita, *L.*
Lycopus Virginicus, *L.*
Origanum vulgare, *L.*
Scutellaria lateriflora, *L.*
Echium vulgare, *L.*
Chenopodium album, *L.*
Polygonum amphibium, *L.*
Euphorbia maculata, *L.*
E. hypericifolia, *L.*
Urtica gracilis, *Ait.*
Humulus Lupulus, *L.*
Juglans nigra, *L.*
Taxus Canadensis, *Willd.*
Sparganium simplex, *Huds.*
Potamogeton Oakesianus, *Robbins.*
P. Claytonii, *Tuckm.*
P. amplifolius, *Tuckm.*
P. gramineus, *L.*
P. lucens, *L.*
P. pusillus, *L.*
Sagittaria variabilis, *Engel.*
Trillium erectum, *L.*
Lilium Philadelphicum, *L.*
Juncus tenuis, *Willd.*
J. marginatus, *Rost.*
Carex lagopodioides, *Schk.*
C. cristata, *Schw.*
C. mirabilis, *Dew.*
C. scoparia, *Schk.*
C. straminea, *Schk.*
C. tenera, *Dew.*
C. stipata, *Muhl.*
C. sparganioides, *Muhl.*
C. sterilis, *Willd.*
C. gynandra, *Schw.*
C. gracillima, *Schw.*
C. formosa, *Dew.*
C. conoidea, *Schk.*
C. virescens, *Muhl.*
C. triceps, *Mx.*
C. laxiflora, *Lam.*
C. arctata, *Boott.*

Carex debilis, *Mx.*
C. flava, *L.*
C. tentaculata, *Muhl.*
C. oligosperma, *Mx.*
Leersia Virginica, *Willd.*
L. oryzoides, *Sw.*
Agrostis scabra, *Willd.*
A. perennans, *Tuckm.*
A. vulgaris, *With.*
A. alba, *L.*
Muhlenbergia sylvatica, *T. and G.*
M. Mexicana, *Trin.*
Spartina cynosuroides, *Willd.*
Dactylis glomerata, *L.*
Phleum pratense, *L.*
Festuca elatior, *L.*
F. nutans, *Willd.*
Poa alsodes, *Gr.*
P. serotina, *Ehrh.*
P. pratensis, *L.*
Glyceria acutiflora, *Torr.*
G. fluitans, *R. Br.*
G. Canadensis, *Trin.*
G. pallida, *Trin.*
G. nervata, *Trin.*
Eatonia obtusata, *Gr.*
E. Pennsylvanica, *Gr.*
Panicum agrostoides, *Spreng.*
P. depauperatum, *Muhl.*
P. dichotomum, *L.*
P. Crus-galli, *L.*
Phalaris arundinacea, *L.*
Anthoxanthum odoratum, *L.*
Elymus Virginicus, *L.*
Elymus Canadensis, *L.*
Triticum violaceum, *Hornem.*
T. repens, *L.*
Setaria viridis, *Beauv.*
Phegopteris polypodioides, *Fee.*
P. hexagonoptera, *Fee.*
Aspidium Noveboracense, *Sw.*
A. aculeatum, *Sw.*
Pteris aquilina, *L.*
Equisetum sylvaticum, *L.*
E. limosum, *L.*
Bartramia Marchica, *Brid.*
Coprinus micaceus, *Fr.*
Stereum rugosum, *Fr.*
S. sanguinolentum, *Fr.*
Polyporus pubescens, *Fr.*
P. pergamenus, *Fr.*
P. ferruginosus, *Fr*
Hydnum alutaceum, *Pers.*
Tremella sarcoides, *Sm.*
Ptychogaster albus, *Cd.*
Septoria Rhoidis, *B. and C.*
S. Rubi, *B. and C.*
Haplographium apiculatum, *Pk.*
Ramularia obovata, *Fckl.*
Trichoderma viride, *Pers.*
Sphærotheca Castagnei, *Lev.*
Erysiphe lamprocarpa, *Lev.*
Stictis versicolor, *Fr.*
Xylaria digitata, *Grev.*
Hypoxylon multiforme, *Fr.*
Eutypa spinosa, *Tul.*
Sphæria Coryli, *Batsch.*
S. callista, *B. and R.*

Species new to the Herbarium.

Triosteum angustifolium, *L.*
Carum Carui, *L.*
Coreopsis discoidea, *T. and G.*
Lamium maculatum, *L.*
Potamogeton rufescens, *Schrad.*
Eleocharis quadrangulata, *Br.*
Carex adusta, *Boott.*
C. glaucodea, *Tuckm.*
C. Sullivantii, *Boott.*
Polypogon Monspeliensis, *Desf.*
Zea Mays, *L.*
Nitella opaca, *Ag.*
N. intermedia, *Nordst.*
Agaricus spectabilis, *Fr.*
A. ornellus, *Pk.*
Hygrophorus limacinus, *Fr.*
Polyporus hypococcinus, *Berk.*
P. undosus, *Pk.*
P. semipileatus, *Pk.*
Irpex viticola, *C. and P.*
Grandinia crustosa, *Fr.*
Pterula densissima, *B. and C.*
Tremella epigæa, *B. and Br.*
T. subochracea, *Pk.*
Hymenula vulgaris, *Fr.*
Geaster mammosus, *Chev.*
Arcyria macrospora, *Pk.*
Cribraria dictydioides, *C. and B.*
Hendersonia Cydoniæ, *C. and E.*
Phyllosticta Grossulariæ, *Sacc.*
P. Nesææ, *Pk.*
Septoria Galeopsidis, *West.*
S. Hydrocotyles, *Desm.*
S. Violæ, *West.*
S. Cucurbitacearum, *Sacc.*
S. corylina, *Pk.*
S. betulicola, *Pk.*
S. microsperma, *Pk.*
S. Pileæ, *Thum.*
Septoglœum Apocyni, *Pk.*
Vermicularia circinans, *Berk.*
Morthiera Thumenii, *Cke.*
Pestalozzia Stevensonii, *Pk.*
Puccinia Thalictri, *Chev.*

Puccinia Cirsii, *Lasch.*
P. simplex, *Pk.*
Protomyces polysporus, *Pk.*
Æcidium pedatatum, *Schw.*
Helicomyces mirabilis, *Pk.*
Septocylindrium Ranunculi, *Pk.*
Ramularia Spirææ, *Pk.*
R. rufomaculans, *Pk.*
R. sambucina, *Pk.*
R. Impatientis, *Pk.*
R. Rudbeckii, *Pk.*
Cercosporella reticulata, *Pk.*
Cerccspora depazeoides, *Sacc.*
C. beticola, *Sacc.*
C. Violæ, *Sacc.*
C. Bœhmeriæ, *Pk.*
C. Acalyphæ, *Pk.*
C. graphioides, *Ell.*
C. clavata, *Ger.*
Verticillium candidum, *Pk.*
Diplocladium minus, *Bon.*
Fusisporium tenuissimum, *Pk.*
Aspergillus phæocephalus, *D. and M.*
A. clavellus, *Pk*
Monilia Harknessii, *Pk.*
Ellisiella caudata, *Sacc.*
Sporocybe nigriceps, *Pk.*
Periconia sphærophila, *Pk.*
Graphium gracile, *Pk.*
Macrosporium concinnum, *Berk.*
Helminthosporium Tiliæ, *Fr.*
H. septemseptatum, *Pk.*
H. inconspicuum, *C. and E.*
H. arbusculoides, *Pk.*
Zygodesmus bicolor, *C. and E.*
Rhinotrichum subalutaceum, *Pk.*
Zasmidium cellare, *Pers.*
Peziza hydrophila, *Pk.*
P. atrata, *Fr.*
P. fusarioides, *Berk.*
P. aurelia, *Pers.*
P. balsamicola, *Pk.*
Meliola balsamicola, *Pk.*
Hypoxylon marginatum, *Schw.*
Diatrype punctulata, *B. and R.*
Diatrypella angulata, *Fr.*
Valsa myinda, *C. and E.*
Dothidea melanoplaca, *Desm.*
Lophiostoma angustilabrum, *B. and Br.*
Sphærella Leersiæ, *Pass.*

(2.)

PLANTS COLLECTED.

Not new to the Herbarium.

Ranunculus abortivus, *L.*
Brassica arvensis, *L.*
Viola Selkirkii, *Pursh.*
Acer Pennsylvanicum, *L.*
Trifolium repens, *L.*
Rubus triflorus, *Richardson.*
Tiarella cordifolia, *L.*
Heracleum lanatum, *Mx.*
Tanacetum vulgare, *L.*
Vaccinium corymbosum, *L.*
V. Pennsylvanicum, *Lam.*
Scutellaria galericulata, *L.*
Marrubium vulgare, *L.*
Polygonum orientale, *L.*
Fraxinus pubescens, *Lam.*
F. sambucifola, *Lam.*
Quercus alba, *L.*
Q. coccinea, *Wang.*
Q. tinctoria, *Bart.*
Q. rubra, *L.*
Carya amara, *Nutt.*
Potamogeton gramineus, *L.*
P. pusillus, *L.*
P. pectinatus, *L.*
Polygonatum giganteum, *Diet.*
Uvularia sessilifolia, *L.*
Carex vulpinoidea, *Mx.*
C. cephalophora, *Muhl.*
C. Muhlenbergii, *Schk.*
C. lagopodioides, *Schk.*
C. cristata, *Schw.*
C. mirabilis, *Dew.*
C. adusta, *Boott.*
C. stricta, *Lam.*
C. granularis, *Muhl.*
C. gracillima, *Schw.*
C. virescens, *Muhl.*
C. plantaginea, *Lam.*
C. laxiflora, *Lam.*
C. Emmonsii, *Dew.*
C. Pennsylvanica, *Lam.*
Zizania aquatica, *L.*
Stipa avenacea, *L.*
Bromus racemosus, *L.*
Poa trivialis, *L.*
Aira flexuosa, *L.*
Osmunda cinnamomea, *L.*
Aspidium Boottii, *Tuckm.*

New to the Herbarium.

Agaricus alluviinus, *Pk.*
A. rubrotinctus, *Pk.*
A. albus, *Schæff.*
A. stellatus, *Fr.*
A. pascuus, *Pers.*
A. sinuatus, *Fr.*
A. fastibilis, *Fr.*
A. alnicola, *Fr.*
A. sulcatipes, *Pk.*
A. hærens, *Pk.*
A. tiliophilus, *Pk.*
A. nitidipes, *Pk.*
A. epimyces, *Pk.*
Hygrophorus fuligineus, *Frost.*
H. flavodiscus, *Frost.*
Russula heterophylla, *Fr.*
Marasmius salignus, *Pk.*
Polyporus immitis, *Pk.*
P. fraxinophilus, *Pk.*
Irpex crassus, *B. and C.*
I. mollis, *B. and C.*
Corticium effuscatum, *C. and E.*
Thelephora rosella, *Pk.*
Clavaria pinophila, *Pk.*
Cyphella læta, *Fr.*
Phoma cucurbitale, *B. and C.*
Sphæropsis Caryæ, *C. and E.*
Discella hysteriella, *Pk.*
D. albomaculans, *Pk.*
Glœosporium fraxinea, *Pk.*
Septoria cannabina, *Pk.*
S. Sicyi, *Pk.*
S. Calystegiæ, *Sacc.*
S. Cirsii, *Niessl.*
Septoria musiva, *Pk.*
Phyllosticta Cratægi, *Pk.*
P. variabilis, *Pk.*
Protomyces macrosporus, *Ung.*
Ustilago pallida, *Schrœt.*
Acalyptospora Populi, *Pk.*
Macrosporium transversum, *Pk.*
Alternaria tenuis, *Nees.*
Ellisiella caudata, *Sacc.*
Botrytis ceratioides, *Pk.*
Dactylium dendroides, *Fr.*
Verticillium Lactarii, *Pk.*
Cercospora Tiliæ, *Pk.*
C. Lepidii, *Pk.*
C. Daturæ, *Pk.*
C. longispora, *Pk.*
C. varia, *Pk.*
Ramularia Ranunculi, *Pk.*
R. Vaccinii, *Pk.*
R. Hamamelidis, *Pk.*
R. aquatilis, *Pk.*
Asterophora Pezizæ, *Cd.*
Peziza lætirubra, *Che.*
P. singularia, *Pk.*
Tympanis Nemopanthis, *Pk.*
Cenangium betulinum, *Pk.*
Triblidium clavæsporum, *Pk.*
Ascomyces deformans, *Berk.*
Gymnascella aurantiaca, *Pk.*
Valsa tomentella, *Pk.*
Sphæria petiolophila, *Pk.*
Sphærella fraxinea, *Pk.*
Venturia curviseta, *Pk.*

(3.)

CONTRIBUTORS AND THEIR CONTRIBUTIONS.

Mrs. S. M. Rust, Syracuse, N. Y.

Potamogton crispus, *L.*
Geranium maculatum, *L.*
Smilax hispida, *Muhl.*

Mary E. Banning, Baltimore, Md.

Pachyma Cocos, *Fr.*

Lizzie G. Barnett, Cannonsburg, Pa.

Secotium Warnei, *Pk.*

Eloise Butler, Minneapolis, Minn.

Secotium Warnei, *Pk.*

W. R. Gerard, New York, N. Y.

Æcidium Rusbyi, *Ger.*
Polyporus arcularius, *Fr.*

J. B. Ellis, Newfield, N. J.

Corticium effuscatum, *C. and E.*
Rostafinskia australis, *Speg.*
Lycoperdon constellatum, *Fr.*
Puccinia Mikaniæ, *Speg.*
Graphium verticillatum, *Speg.*

C. J. Sprague, Boston, Mass.

Lecidea vescicularis *Hoffm.*
Biatora globifera, *Ach.*

S. H. Wright, M. D., Penn Yan, N. Y.

Æcidium Asperifolii, *Pers.*
Æ. Falcarii, *D. C.*
Puccinia coronata, *Cd.*
Erysiphe Montagnei, *Lev.*
Polythrincium Trifolii, *Cd.*
Peronospora Schachtii, *Fckl.*

E. C. Howe, M. D., Yonkers, N. Y.

Eragrostis pilosa, *Beauv.*
E. Purshii, *Schrad.*
Carex Muhlenbergii v. enervis, *Boott.*

M. F. Merchant, M. D., Moravia, N. Y.

Mitchella repens, *L.*

H. W. Barnum, Valley Falls, N. Y.

Trillium grandiflorum, *Salisb.*

Prof. C. E. Bessey, Ames, Iowa.

Secotium Warnei, *Pk.*

C. W. Irish, Iowa City, Iowa.

Polyporus fraxinophilus, *Pk.*
Trametes Peckii, *Kalchb.*

I. Cowles, Flushing, N. Y.

Opuntia Rafinesquii, *Engelm.*

J. L. Bennett, Providence, R. I.

Carex cristata *Schw.*
C. aurea, *Nutt.*
C. miliaris, *Mx.*
C. microdonta, *Torr.*
C. panicea, *L.*
C. vividula, *Mx.*
C. festiva, *Dew.*
C. sycnocephala, *Carey.*
C. athrostachya, *Olney.*
C. scoparia, *Schk.*
C. lagopodioides, *Schk.*
C. festucacea, *Schk.*
C. straminea, *Schk.*
C. Haleana, *Olney.*
C. alata, *Torr.*
C. Bonplandii, *Kunth.*
C. torta, *Boott.*
C. crinita, *Lam.*
C. pallescens, *L.*
C. flaccosperma, *Dew.*
C. grisea, *Wahl.*
C. virescens, *Muhl.*
C. gynocrates, *Wormsk.*
C. capitata, *L.*
C. nigricans, *Mey.*
C. pauciflora, *Lightf.*
C. filifolia, *Nutt.*
C. polytrichoides, *Muhl.*
C. Muhlenbergii, *Schk.*
Carex conjuncta, *Boott.*
C. alopecoidea, *Tuckm.*
C. rosea, *Schk.*
C. stipata, *Muhl.*
C. sparganioides, *Muhl.*
C. cephaloidea, *Boott.*
C. cephalophora, *Muhl.*
C. bicostata, *Olney.*
C. vulpinoidea, *Mx.*
C. Kunzei, *Olney.*
C. Gayana, *Desu.*
C. teretiuscula,
C. prairea, *Dew.*
C. siccata, *Dew.*
C. disticha, *Huds.*
C. bromoides, *Schk.*
C. stenophylla, *Wahl.*
C. Douglassii, *Boott.*
C. chordorhiza, *Ehrh.*
C. tenella, *Schk.*
C. canescens, *L.*
C. vitilis, *Fr.*
C. tenuiflora, *Wahl.*
C. trisperma, *Dew.*
C. Deweyana, *Schw.*
C. albolutescens, *Schw.*
C. maritima, *Mull.*
C. aquatilis, *Wahl.*
C. lenticularis, *Mx.*

Carex aperta, *Boott.*
C. rigida, *Good.*
C. limosa, *L.*
C. Buxbaumii, *Wahl.*
C. Steudellii, *Kunth.*
C. atrata, *L.*
C. nigra, *Alli.*
C. Willdenovii, *Schk.*
C. Backii, *Boott.*
C. Geyeri, *Boott.*
C. longirostris, *Torr*
C. amplifolia, *Boott.*
C. Fraseriana, *Sims.*
C. retroflexa, *Muhl.*
C. stellulata, *Good.*
C. Davisii, *S. & T.*
C. gracillima, *Schw.*
C. triceps, *Mx.*
C. plantaginea, *Lam.*
C. Careyana, *Torr.*
C. platyphylla, *Carey.*
C. retrocurva, *Dew.*
C. laxiflora, *Lam.*
C. eburnea, *Boott.*
C. umbellata, *Schk.*
C. Emmonsii, *Dew.*
C. nigromarginata, *Schw.*
C. Pennsylvanica, *Lam.*
C. varia, *Muhl.*
C. Richardsonii, *R. Br.*
C. pubescens, *Muhl.*

Carex miliacea, *Muhl.*
C. arctata, *Mx.*
C. debilis, *Mx.*
C. filiformis, *L.*
C. striata, *Mx.*
C. trichocarpa, *Muhl.*
C. Pseudo-Cyperus, *L.*
C. hystricina, *Willd.*
C. intumescens, *Rudge.*
C. Grayii, *Carey.*
C. lupulina, *Muhl.*
C. subulata, *Mx.*
C. squarrosa, *L.*
C. retrorsa, *Schw.*
C. Schweinitzii, *Dew.*
C. utriculata, *Boott.*
C. monile, *Tuckm.*
C. pulla, *Mx.*
C. Whitneyi, *Olney.*
C. Tuckermani, *Boott.*
C. Olneyi, *Boott.*
C. Raynoldii, *Dew.*
C. podocarpa, *R. Br.*
C. fœtida, *All.*
C. Rossii, *Boott.*
C. Halleriana, *Asso.*
C. Cherokeensis, *Schw.*
C. debilis. *Mx.*
C. oxylepis, *Torr.*
C. Boottiana, *Benth.*

(4.)

SPECIES NOT BEFORE REPORTED.

ERAGROSTIS PURSHII, *Schrad.*

Waste places about Yonkers. *E. C. Howe.*

AGARICUS METULÆSPORUS, *B. and Br.*

Woods. Adirondack mountains. August and September.

AGARICUS ALLUVIINUS, *Pk.*

Alluvial soil, among weeds. Albany. July.

AGARICUS RUBROTINCTUS, *Pk.*

Thin woods and open places. July—September.

For the description of this and the two species next preceding, see the synopsis of the subgenus Lepiota in the closing pages of this report.

AGARICUS ALBUS, *Schæff.*

Woods. East Berne, Albany county. August.

AGARICUS STELLATUS, *Fr.*

Decaying prostrate trunks of trees in woods. East Berne, August.

AGARICUS PASCUUS, *Pers.*

Woods. East Berne. August. Sometimes the freshly broke plant has a slight odor of meal.

AGARICUS SINUATUS, *Fr.*

Woods. East Berne. August.

AGARICUS FASTIBILIS, *Fr.*

Thin woods. Albany. October. The plant here noticed is white variety, approaching var. *alba,* but with a short stem The spores are almost ochraceous. The drops of moisture on th lamellæ at length dry up and leave brownish stains or granule resembling those on the stem and tubes of *Boletus granulatus.*

AGARICUS ALNICOLA, *Fr.*

In low swampy woods about the base of alders. Sandlake October.

AGARICUS (GALERA) SULCATIPES, *n. sp.*

Pileus thin, ovate, then conical or subcampanulate, hygroph anous, chestnut-colored and generally striatulate on the margi when moist, becoming paler when dry; lamellæ ascending, sub distant, adnate, whitish, becoming ferruginous-cinnamon, ster slender, straight or flexuous, equal, hollow, rather tenaciou striate-sulcate, silky, floccose-pruinose toward the base, white often tinged with blue or green at the base; spores elliptical, fer ruginous-cinnamon, ·00025—·0003′ long, ·00016′ broad.

Plant gregarious, 1·5′—3′ high, pileus 5″—8″ broad, stem 1′ thick.

Woods. East Berne. August.

The plants were found growing on a bed of buckwheat bran The stem is white and almost shining; striate and silky above and pulverulent or floccose-pruinose at the base, where it generall assumes a greenish-blue color if handled when moist. When dr the stem is distinctly furrowed. The pileus fades in drying t subochraceous or subalutaceous. The lamellæ are sometime white on the edge.

AGARICUS (CREPIDOTUS) HÆRENS, *n. sp.*

Pileus convex, sessile, cuneiform or dimidiate, glabrous, hy grophanous, viscid and striatulate on the margin when moist white or whitish when dry; lamellæ moderately close, narrow tapering toward each end, subcinereous, then brownish; spore elliptical, pale-ferruginous, ·0003′ long, ·0002′ broad.

Pileus 4″—12″ long and broad.

Decaying wood. Albany. September.

The elliptical spores and viscid pileus are distinguishing characters in this species. The pileus is often stained by the spores and it then has a sordid or squalid appearance. When not so stained it is very white if dry, watery-white if moist. The margin is very thin. The lamellæ are dingy, when young, and they become darker with age. The stem is wanting or merely rudimentary. The pileus is attached by white filaments.

AGARICUS (CREPIDOTUS) TILIOPHILUS, *n. sp.*

Pileus rather thin, convex, minutely pulverulent or subglabrous, hygrophanous, watery-brown and striatulate on the margin when moist, dingy buff-color when dry; lamellæ rather broad, subdistant, rounded behind, adnexed, colored like the pileus, becoming ferruginous-cinnamon; stem very short, often curved, solid, eccentric, whitish, pruinose, with a white pubescence at the base; spores ovate or subelliptical, brownish-ferruginous, ·0002′—·00025′ long, ·00016′—·00018′ broad.

Pileus 6″—12″ broad, stem 2″—4″ long, 1″ thick.

Dead trunks and branches of basswood, *Tilia Americana*. East Berne. August.

Sometimes the plants are so closely crowded that they appear cæspitose.

AGARICUS (HYPHOLOMA) NITIDIPES, *n. sp.*

Pileus fleshy, firm, convex, glabrous or obscurely fibrillose, whitish or yellowish; lamellæ close, adnexed, whitish or subcinereous, becoming rosy-brown, generally white on the edge; stem equal or slightly thickened at the base, solid, silky, shining, whitish; spores ovate, rosy-brown, ·0002′—·00025′ long, ·00016′—·00018′ broad.

Plant 2 —4′ high, pileus 2′—3′ broad, stem 3′ —4″ thick.

Damp, shaded ground. Albany. September.

Externally this species resembles *A. præcox*, from which its solid stem and smaller spores at once distinguish it.

AGARICUS (PANÆOLUS) EPIMYCES, *n. sp.*

Pileus fleshy, at first subglobose, then convex, white, silky-fibrillose, flesh soft, white or whitish: lamellæ rather broad, somewhat close, rounded behind, adnexed, dingy-white, becoming brown or blackish, with a white edge; stem short, stout, tapering upwards, strongly striate and minutely mealy or pruinose, solid in the young plant, hollow in the mature plant, but with the cavity small, hairy or substrigose at the base; spores elliptical, black, ·0003′—·00035′ long, ·0002′—·00025′ broad.

Plant 1′—1·5′ high, pileus 8″—12″ broad, stem 3″—4″ thick.

Parasitic on fungi. North Greenbush. November.

This singular species is referred to the subgenus Panæolus because of its black spores. Its thick, fleshy stem and pileus do not well accord with the character of these parts in the other species of this subgenus, and, notwithstanding the color of the spores, it may seem best to some to refer the species to the subgenus Hypholoma. *A. Loveianus*, *A. alumnus*, *A. cirrhatus*, *A. tuberosus*, *A. racemosus* and *A. pilipes* are other species of Agarics which are parasitic on putrid fungi. The species of Nyctalis also have a similar habitat.

HYGROPHORUS FULIGINEUS, *Frost MS.*

Pileus convex or plane, smooth, glutinous, fuscous or smoky-brown, the disk usually darker or almost black, the margin sometimes wavy or irregular, and in old specimens often reflexed, flesh white; lamellæ moderately broad, adnate or decurrent, subdistant, white, the interspaces often veiny; stem variable, long or short, equal or ventricose, sometimes attenuated at the base, solid, glutinous, white, sometimes slightly stained with smoky-brown; spores elliptical, ·0003′—·00035′ long, ·0002′ broad.

Plant 2′—4′ high, pileus 1′—4′ broad, stem 4″—10″ thick.

Pine woods. West Albany. November.

The abundant gluten which covers the pileus gives it when dry a shining appearance, as if varnished. There is a short space at the top of the stem which is free from gluten, slightly silky and very white. The plant grows either singly or in tufts of three or four individuals.

HYGROPHORUS FLAVODISCUS, *Frost MS.*

Pileus convex or plane, smooth, glutinous, white, with a pale-yellow or reddish-yellow disk, flesh white; lamellæ adnate or decurrent, subdistant, white, sometimes with a slight flesh-colored tint, the interspaces sometimes veiny; stem subequal, solid, glutinous, white, sometimes slightly stained with yellow; spores elliptical, ·00025′—·0003′ long, ·00016′ broad.

Plant 2′—3′ high, pileus 1′—3′ broad, stem 2″—8″ thick.

Pine woods. West Albany. November.

The late Mr. C. C. Frost sent me manuscript descriptions of a few species of fungi which he had found in Vermont and regarded as new species. Among them are descriptions of the two species of Hygrophorus now found for the first time within our limits. I have adopted the names given by Mr. Frost, but have remodeled his descriptions and extended them so as to include the character and dimensions of the spores. Both species were found growing together, and but for the marked difference in the coloration of the pileus both might readily be taken for forms of one species.

This, like the preceding one, has a short white space at the top of the stem, free from the viscidity that exists elsewhere. It resembles in many respects *Hygrophorus speciosus*, which has the pileus red, fading to yellow with advancing age. Perhaps the three may yet prove to be forms of one very variable species, for the most conspicuous differences between them consist in the colors of the pileus. The constancy with which the three styles of coloration has thus far been maintained indicates a specific difference, but color alone is not generally regarded as having any specific value.

RUSSULA HETEROPHYLLA, *Fr.*

Woods. East Berne. August.

MARASMIUS SALIGNUS, *n. sp.*

Pileus submembranous, convex or plane, without striæ, dry, glabrous or subpruinose, whitish; lamellæ rather narrow, adnate, subdistant, whitish, sometimes united behind in pairs, occasionally branched; stem short, slender, stuffed, reddish-brown, slightly mealy or pruinose, inserted; spores ovate or subelliptical, pointed at one end, ·00025′—·00032′ long, 00016′ broad.

Plant 6″—10″ high, pileus 2″—5″ broad, stem scarcely half a line thick.

Bark of living willow trees. Bethlehem. September.

This species is closely related to *M. ramealis*, but in that species the pileus, according to the description, is rufescent either wholly or on the disk, and the stem is white; in our species the pileus is white or whitish and the stem is reddish-brown. Only in young specimens is the stem white and then only at the apex. Sometimes there is a slight depression or umbilicus in the center of the pileus.

POLYPORUS (MERISMA) IMMITIS, *n. sp.*

Pilei cæspitose-imbricated, broad, slightly convex or flattened, more or less rough or uneven, radiate-rugose, tuberculose or fibrous-hispid, zoneless, white, becoming tinged with yellow or alutaceous in drying, flesh white, slightly fibrous, soft and moist when fresh, cheesy when dry, with a subacid odor; pores minute angular or even subflexuous, about equal in length to the thickness of the pileus, the dissepiments thin, white, often at length dentate or lacerate on the edge; spores minute, white, elliptical, ·00012′—·00016′ long, ·00007′—·00008′ broad.

Pilei 2′—4′ broad, the flesh commonly 3″—4″ thick.

Decaying ash trunks. East Berne. August.

The species is apparently related to *P. cæsareus*, but the character of the pores is quite different in the two species.

POLYPORUS (PLACODERMEI) FRAXINOPHILUS, *Pk.*

Pileus sessile, thick, corky, subtriquetrous, narrow, somewhat decurrent behind, the first year whitish, with a minute whitish tomentum or hairiness, then gray, finally blackish, in old specimens concentrically sulcate, rimose, the substance within obscurely zoned, at first whitish, then isabelline or pale-tawny, the margin obtuse; pores stratose, plane or subconvex, small, nearly equal, subrotund, the dissepiments obtuse, entire, whitish; spores white, broadly elliptical, ·0003—·00035′ long, ·00025′—·0003′ broad.

Pileus 2′—4′ long, 1′—1·5′ broad.

Trunks and branches of dead or languishing ash trees. Coeymans, Albany county. May and September.

The species belongs to the tribe *Fomentarii*, and is related by its whitish pores and surface to *P. connatus*, but its colored substance and larger pores will easily distinguish it from that species.

IRPEX CRASSUS, *B. and C.*

Oak stumps. North Greenbush. October.

IRPEX MOLLIS, *B. and C.*

Decaying wood. Helderberg mountains. October.

The teeth in this species are sometimes compressed in such a manner that they appear like radiating lamellæ broken up into narrow segments. They have a coarse stout appearance even when most of them are subulate. The pileus is whitish and moist when fresh. A resupinate form occurs, both of this species and of *I. lacteus.*

CORTICIUM EFFUSCATUM, *C. and E.*

Dead branches. East Berne. August.

THELEPHORA ROSELLA, *n. sp.*

Very small, tufted, rosette-like, variously laciniate, dentate or subfimbriate on the margins, whitish or subincarnate, developing from a blackish tubercle; spores minute, narrowly elliptical or sublanceolate, ·0002′—·00025′ long, scarcely half as wide.

Dead branches of alder, *Alnus incana.* Sandlake. July.

This is a very singular species, and may prove to be an imperfect condition of some fungus quite unlike this one.

CLAVARIA PINOPHILA, *n. sp.*

Stems short, more or less tufted, much branched; branches crowded, often compressed above and subdigitately divided, pale-ochraceous, ultimate ramuli rather long, subulate, white; spores oblong or sublanceolate, ·0004′—·0005′ long, ·00016′ broad.

Thin woods under pine trees. East Berne. August.

The tufts are about one inch high. The spores appear white when caught on brown paper.

CYPHELLA LÆTA, *Fr.*

Dead stems of herbs lying on the ground. East Berne. August.

The beautiful sulphur color is lost in drying.

PHOMA CUCURBITALE, *B. and C.*

Old squashes. Sandlake. July.

SPHÆROPSIS CARYÆ, *C. and E.*

Dead bark of hickory trees. *Carya alba*. West Troy. May.

The perithecia do not always grow in lines, but are frequently arranged in an irregular manner.

DISCELLA HYSTERIELLA, *n. sp.*

Perithecia hysteriiform, nestling in the fibres of the wood, opening by a longitudinal chink or a wide elliptical aperture, black; spores numerous, oblong, obtuse at each end, colorless, obscurely uniseptate, ·0003′—·0004′ long, ·00012′—·00015′ broad.

Decorticated wood. North Greenbush. Autumn and Spring.

DISCELLA ALBOMACULANS, *n. sp.*

Perithecia punctiform, hemispherical, prominent, gregarious on an indefinite whitish spot, black, opening by a simple irregular or triradiate aperture; spores abundant, oblong, colorless, obscurely uniseptate, ·0004′—·0005′ long, ·00012′ broad.

Dead twigs of grape-vines. Helderberg mountains. May.

Related to, but distinct from, the preceding by its perithecia, narrower and longer spores and by its forming a whitish spot on the matrix.

GLŒOSPORIUM FRAXINEA, *n. sp.*

Spots numerous, small, pale-red with a darker or purplish-red border and usually with a minute whitish center, nuclei few; spores oblong-elliptical, colorless, ·0002′—·00025′ long, ·00016′ broad, sometimes with a minute nucleus at each end.

Living leaves of ash, *Fraxinus pubescens*. Albany. June.

SEPTORIA CANNABINA, *n. sp.*

Spots suborbicular, small, unequal, cinereous, often with a reddish-brown border; perithecia minute, numerous, epiphyllous, central on the spot, blackish; spores filiform, colorless, curved, ·0008′—·0012′ long.

Living leaves of hemp, *Cannabis sativa*. Cold Spring. June.

SEPTORIA SICYI, *n. sp.*

Spots small, suborbicular, scattered or rarely subconfluent, whitish or cinereous, arid; perithecia few, epiphyllous, blackish; spores filiform, straight or curved, colorless, ·0016′—·0024′ long.

Living leaves of *Sicyos angulatus*. Albany. June.

SEPTORIA CALYSTEGIÆ, *Sacc.*

Living leaves of *Calystegia Sepium*. Albany. June.

SEPTORIA CIRSII, *Niessl.*

Living leaves of Canada thistle, *Cirsium arvense.* West Albany. June.

SEPTORIA MUSIVA, *n. sp.*

Spots small, numerous, angular, brown, usually obscurely mottled by minute angular patches of paler color; perithecia few, epiphyllous, depressed, black or blackish; spores cylindrical, slightly curved, colorless, sometimes obscurely triseptate, ·0012′—·0018′ long.

Living leaves of cottonwood, *Populus monilifera.* Albany. July.

This species differs from *S. Populi*, Desm., in the character of the spots which are variegated like mosaic work, and in the septation of the spores.

PHYLLOSTICTA CRATÆGI, *n. sp.*

Spots small, angular or irregular, sometimes confluent, red; perithecia one to five on a spot, epiphyllous, minute, black; spores broadly elliptical or subglobose, colorless, ·0003′ long, ·00025′ broad.

Living leaves of thorn bushes, *Cratægus tomentosa.* Albany. July.

PHYLLOSTICTA VARIABILIS, *n. sp.*

Spots small or large, suborbicular or irregular, brown or reddish-brown, the center at length dotted with whitish arid areas or becoming entirely arid, finally falling away; perithecia minute, epiphyllous, black; spores oblong-elliptical, colorless, ·0002′—·0003′ long, ·0001′—·00012′ broad.

Living leaves of purple-flowered raspberry, *Rubus odoratus.* Albany. September.

PROTOMYCES MACROSPORUS, *Ung.*

Living leaves and stems of the great ragweed, *Ambrosia trifida.* Albany. June.

When this fungus attacks the stems it forms prominent swellings which are generally about half an inch long and nearly as broad and of a pale-green color. The spores are globose or subglobose and vary considerably in size, ranging from ·0014′—·0024′ in diameter. They are imbedded in the tissues of the swellings.

USTILAGO PALLIDA, *Schrœt.*

Flowers of wild buckwheat, *Polygonum cilinode.*

Three species of smut occur on our knot-weeds. *Ustilago utriculosa* is common on *Polygonum Pennsylvanicum*, *U. Candollei* is found on *P. sagittatum* and *U. pallida* on *P. cilinode.* Catskill mountains and Grafton, Rensselaer county.

ACALYPTOSPORA POPULI, *n. sp.*

Spots irregular or suborbicular, reddish-brown, definite; spores epiphyllous, oblong-ovate or subfusiform, scarcely pedicellate, colored, one to two-septate, ·0008′—·0009′ long, ·0003′—·00033′ broad.

Living leaves of the great-toothed poplar, *Populus grandidentata*. Center. July.

The fungus was found on the leaves of young trees. The affected tissues soon break up and fall out. The spores appear to form gummy patches or reticulations slightly darker than the general color of the spot.

MACROSPORIUM TRANSVERSUM, *n. sp.*

Spots pale, at first greenish-yellow, then whitish and arid, sometimes with a reddish-brown border, forming transverse bands on the leaf; flocci tufted, subflexuous, septate, colored, ·0016′—·0025 long, ·00016′—·0002′ broad; spores apical, oblong-ovate or oblong-clavate, either obtuse at both ends or acuminate or subrostrate at one end, three to five-septate, with here and there a longitudinal septum, colored, ·001′—·002′ long.

Living leaves of *Carex stricta*. West Albany. May.

The discolored spots are often sterile. Frequently the leaves are narrowed at the affected spots by the contraction of the tissues and are thereby weakened and abruptly bent.

ALTERNARIA TENUIS, *Nees*.

Inner surface of old pods of silkweed, *Asclepias Cornuti*. North Greenbush. November.

In some specimens the rostrum of the spores is not dilated at the apex as figured by Corda, but as the two forms grow intermingled in the same patch they are evidently all one species. The spots, as I find them, are generally thinly effused and indefinite, not definite as figured in "*Fungi Italici*."

ELLISIELLA CAUDATA, *Sacc*.

Dead leaves of broom-grass, *Andropogon scoparius*. Center. May.

This genus appears to me to be founded on very slight characters. It scarcely differs from Colletotrichum, except in having the spores longer pointed.

BOTRYTIS CERATIOIDES, *n. sp.*

Flocci white, flaccid, suberect, obscurely septate, simple or sparingly branched, obtuse and sometimes bilobed at the apex, the upper part densely pulverulent with spores; spores globose, smooth, subochraceous or isabelline, ·00025′—·0003′ in diameter.

Decaying wood of hemlock, *Abies Canadensis*. Albany. June.

This fungus forms more or less extensive patches over the surface of the wood. The upper part of the flocci being covered with spores, the general aspect is somewhat similar to that of some species of Ceratium, *e. g.*, *C. hydnoides*. The spores are so abundant that they hide the flocci and at first sight the whole fungus appears to be pale ochraceous. The smooth spores and white flocci separate this species from *B. carnea*, Schum.

DACTYLIUM DENDROIDES, *Fr.*

Decaying wood and fungi. East Berne. August.

Verticillium agaricinum, Bon., is closely related if not, indeed, the same species.

VERTICILLIUM LACTARII, *n. sp.*

Flocci branched, white; branches either simple, opposite or verticillate, the ultimate ramuli tapering to the apex; spores apical, obovate or oblong-elliptical, smooth, colorless, ·0006′—·0012′ long, ·0004′—·0005′ broad, usually with a slight point or apiculus at the base.

Putrescent Lactarii, especially *L. subdulcis*. Center and East Berne. June — August.

CERCOSPORA TILIÆ, *Pk.*

Living leaves of basswood, *Tilia Americana*. Sandlake. July.

CERCOSPORA LEPIDII, *n. sp.*

Spots small, orbicular, grayish-brown or subcinereous, usually marked with faint concentric lines; flocci amphigenous, about ·0016′ long, single or two to three in a cluster, pallid; spores very long, tapering upwards, slightly constricted at the septa, eight to nine-septate, ·005′—·007′ long, ·0007′—·0008′ broad in the widest part, greenish.

Living leaves of the field pepper-grass, *Lepidium campestre*. New Baltimore, Greene county. May.

This is a very singular species. The fungus occurs on both sides of the leaf, but is more abundant on the upper surface. The flocci are short and thick and occasionally branched. The septa occur in the broad part of the spore, the upper part being much narrowed. Occasionally a cell is divided by a longitudinal septum.

CERCOSPORA DATURÆ, *n. sp.*

Spots suborbicular or irregular, varying in color from cinereous to reddish-brown, sometimes marked by irregular or flexuous elevated lines; flocci amphigenous, scarcely tufted, about equal to the spores in length; spores rather large, narrowed upwards, greenish, four to six-septate, ·002′—·003′ long, about ·0005′ broad in the widest part.

Living leaves of stramonium, *Datura Stramonium*. Cold Spring, Putnam county. June.

CERCOSPORA LONGISPORA, *n. sp*.

Spots suborbicular, sometimes confluent and irregular, grayish-brown, the margin slightly darker; flocci amphigenous, sometimes epiphyllous only, tufted, ·0008′—·0016′ long, colored; spores very long, variously curved or flexuous, colorless, simple or obscurely septate, sometimes forked, ·0024′—·0056′ long, about ·00016′ broad.

Living leaves of lupine, *Lupinus perennis*. Center. July.

The species is apparently very distinct from *C. Lupini*, Cke., and is well marked by its densely tufted black flocci and its very long hyaline spores.

CERCOSPORA VARIA, *n. sp*.

Spots suborbicular, sometimes large and irregular, reddish-brown, with a darker margin, reddish-gray beneath; flocci few, hypophyllous, tufted, short, slightly colored; spores subcylindrical, one to five septate, sometimes multinucleate, ·0016′—·003′ long.

Living leaves of maple-leaved Viburnum. East Berne. August.

A form of this species occurs on *Viburnum Lentago*, in which the spots are brown and the flocci are shorter.

RAMULARIA RANUNCULI, *n. sp*.

Spots suborbicular, scattered, brown; flocci hypophyllous, tufted, colorless, subflexuous; spores oblong, sometimes narrowed toward one end, simple or uniseptate, occasionally catenulate, colorless, ·00065′—·0016′ long, ·0003′—·0005′ broad.

Living leaves of hooked crowfoot, *Ranunculus recurvatus*. West Albany. June.

RAMULARIA VACCINII, *n. sp*.

Spots few or many, orbicular, rarely confluent, whitish or yellowish-green, becoming brown when old; flocci short, nearly colorless, sometimes creeping, hypophyllous, rarely amphigenous, spores very abundant, forming a continuous stratum, often catenulate, very variable, elliptical, ovate, oblong or cylindrical, colorless, ·0003′—·0012′ long, ·00016′—·0002′ broad.

Living leaves of blueberry, *Vaccinium corymbosum* and *Vaccinium Pennsylvanicum*. Center. July.

This species is remarkable both for the abundance and the variability of its spores.

RAMULARIA HAMAMELIDIS, *n. sp*.

Spots small, angular, reddish-brown, a little paler on the lower surface; flocci hypophyllous, tufted, short, slightly colored; spores fusiform or oblong-cylindrical, colorless, ·0005—·0014′ long.

Living leaves of witch-hazel, *Hamamelis Virginica.* Sandlake. July.

Though the spots are distinct enough, the fungus is so minute that it is scarcely visible to the naked eye.

RAMULARIA AQUATILIS, *n. sp.*

Spots small, pale; flocci epiphyllous, tufted, very slender, short, flexuous, white, ·0003′—·0006′ long; spores subfiliform, narrowed toward one end, sometimes three to four-nucleate, colorless, ·0008′—·0012 long, ·0001′—·00012′ broad.

Living leaves of pond-weed, *Potamogeton lonchites.* Albany. September.

The tufts are numerous and very small and white. When magnified they have a stellate appearance, the spores diverging like rays from the central mass of flocci.

ASTEROPHORA PEZIZÆ, *Cd.*

Hymenium of *Peziza hemispherica.* Center. July.

This fungus covers the inner surface of the Peziza with a white stratum of slender filaments and stellately warted spores.

PEZIZA LÆTIRUBRA, *Cke.*

Decaying leaves lying on damp, sandy soil. Center. September.

PEZIZA (MOLLISIA) SINGULARIA, *n. sp.*

Cups minute, waxy, sessile, flattened or convex, not distinctly margined, seated on irregular, indefinite pallid spots, dingy-gray or pale amber-brown; asci cylindrico-clavate, ·002′—·003′ long, ·0003′—·0004′ broad; spores crowded or biseriate, colorless, oblong, sometimes slightly narrowed toward one end, ·0005—·0006′ long, ·00016′—·0002′ broad; paraphyses filiform, scarcely thickened at the apex.

Under surface of living leaves of hispid crowfoot, *Ranunculus hispidus.* East Berne. August.

This is one of the few species of Peziza that attack living plants. Sometimes the cups, or rather the receptacles, are confluent and irregular. Perhaps a form of *Pseudopeziza Ranunculi*, Fckl.

TYMPANIS NEMOPANTHIS, *n. sp.*

Receptacles minute, densely tufted, substipitate, black, at first sphæriiform and opening by a slight irregular chink, then with the disk exposed, slightly margined, concave or plane; asci cylindrical, or oblong-clavate, ·003′—·0045′ long, about ·00032′ broad; spores filiform, variously curved, sometimes multinucleate, ·0016′—·003′ long.

Dead stems and branches of mountain holly, *Nemopanthes Canadensis*. Grafton, Rensselaer county. July.

The tufts are erumpent and quite prominent. They vary much in size, but are generally one to two lines broad. The receptacles are so closely crowded that the disk is often angular from mutual pressure. The species is similar in its appearance to *Tympanis alnea*.

CENANGIUM BETULINUM, *n. sp.*

Receptacles cæspitose or subseriate, erumpent through short transverse chinks in the bark, at first sphæriiform, then open, black, the disk nearly plane, slightly margined, often irregular from mutual pressure, ·007′—·014′ broad; asci oblong or subclavate, ·0016′ long, about ·0004′ broad; spores crowded, oblong, obtuse, slightly colored, triseptate, ·0004′—·0005′ long, about ·00016′ broad.

Dead bark of white birch, *Betula populifolia*. Center. May.

This species differs from *C. seriatum*, which also occurs on birch, in its small size, smaller tufts, which usually contain five to ten plants, and in its septate spores.

TRIBLIDIUM CLAVÆSPORUM, *n. sp.*

Receptacles, when moist, suborbicular, plane or slightly convex, margined, ·03′—·04′ broad, black, when dry more or less contracted, hysteriiform, with thick labiæ; asci clavate or cylindrical, ·0035′—·0045′ long; spores oblong-clavate, crowded or biseriate, colored, four-septate, ·0009′—·0011′ long, ·0003′—·0004′ broad.

Decorticated wood of willows, *Salix nigra*. Albany. July.

ASCOMYCES DEFORMANS, *Berk.*

Living leaves of peach trees. Sandlake.

GYMNASCELLA, *gen. nov.*

Perithecia wanting; asci numerous, subglobose, produced upon or among slender, branching filaments.

Externally this fungus has the aspect of species of Sporotrichum, but the spores are produced in asci.

GYMNASCELLA AURANTIACA, *n. sp.*

Filaments slender, branched, intricate, colored, forming minute subconfluent bright-orange or scarlet-colored tufts; asci numerous, subglobose, produced among the filaments, ·0004′—·0006′ long; spores orbicular, ·00016′—·0002′ broad, crowded in the ascus, colorless, generally uninucleate.

Old bones in damp places. Albany. May.

The bright red color of the tufts readily attract the attention. The spores are flattened, and when viewed edgewise appear narrowly elliptical. The asci are produced upon short branches of the filaments and frequently form dense clusters or masses. I have seen no evidence of a perithecium, and indeed the asci are thin and somewhat fugacious, and from the crowding of the spores are with difficulty seen. I have not been able to detect with certainty more than six spores in an ascus, though probably there are eight in some cases.

By the absence of a perithecium, or receptacle, this fungus is related to Ascomyces and kindred genera, but its whole character otherwise is very different. In its habitat it is related to Onygena, the species of which affect animal substances, but it forms no definite head or peridium. It also presents some analogies with other genera, but with none does it seem to agree in all respects. I am disposed, however, to regard it as belonging to the Onygenei, notwithstanding the absence of a definite peridium.

VALSA (CRYPTOSPORA) TOMENTELLA, *n. sp.*

Perithecia four to eight, subcircinate, nestling in the inner bark, black, clothed below with a whitish tomentum, disk lanceolate, whitish or brownish, erumpent through a narrow transverse chink which is acute at each end, pierced by the smooth black ostiola; asci oblong, broad, subcylindrical to fusiform, sessile, .002′—.003′ long; spores cylindrical, crowded, colorless, more or less curved, obtuse at the ends, usually multinucleate, .002′—.0027′ long, .00016′—.0002′ broad.

Bark of white birch, *Betula populifolia*. West Albany. May.

This species is related to V. *cinctula*, but the peculiar character of the disk and the whitish tomentum that invests the base of the perithecia afford available characters by which to separate it from that and other allied species.

SPHAERIA PETIOLOPHILA, *n. sp.*

Perithecia minute, scattered, covered by the epidermis which is pierced by the prominently papillate or short rostrate ostiola, depressed-globose, black; asci narrow, subcylindrical, .0016′—.0018′ long; spores narrowly fusiform, pointed at each end, colorless, biseriate, .0005′—.0006′ long, about .00008′ broad, sometimes containing three or four nucleoli.

Petioles of fallen leaves of mountain maple, *Acer spicatum*. Helderberg mountains. May.

This species belongs to the modern genus Gnomonia, section

Eugnomonia. In *S. petiolorum* Schw., which according to Fuckel is the same as *S. amœna* Nees., the perithecia are surrounded by a white tubercle and the spores are shorter and half as broad as long.

SPHÆRELLA FRAXINEA, *n. sp.*

Perithecia numerous, minute, .003′ broad, black, either epiphyllous or hypophyllous, generally collected in groups forming suborbicular spots; asci oblong, often slightly narrowed above, .0014′—.0016′ long; spores crowded, oblong-ovate, uniseptate, colorless, .0004′—.00045′ long, .00016′—.0002′ broad, divided by the septum into two very unequal parts, the smaller part one-third or one-fourth the length of the larger.

Fallen leaves of ash, *Fraxinus Americana.* Helderberg mountains. May.

Distinct from *Sphærie Fraxicola* Schw., in the character of the spots and of the perithecia. I have not seen fertile specimens of that species.

VENTURIA CURVISETA, *n. sp.*

Perithecia numerous, minute, .003′—.004′ in diameter, clustered or subgregarious, black, bearing near the apex five to eight diverging black setæ, .003′—.005′ long and abruptly curved near the base; asci oblong, narrowed above, often slightly curved .0016′—.002′ long; spores crowded or biseriate, oblong, colorless, .00045′—.0005′ long, .00016′—.0002′ broad, faintly uniseptate, the upper cell broader than the lower.

Callen leaves of mountain holly, *Nemopanthes Canadensis.* Fenter. May and June.

The peculiar feature of this species is found in the curved bases of the setæ. These are so strongly bent that they spread nearly horizontally and appear like stellate rays when the perithecia are viewed from above. They are few in number and often unequal in length.

(5.)

REMARKS AND OBSERVATIONS.

GERANIUM MACULATUM, *L.*

A form with white flowers. Syracuse. *Mrs. S. M. Rust.*

CASSIA NICTITANS, *L.*

Banks of the Hudson river. North Greenbush.

MITCHELLA REPENS, *L.*

The form producing white berries occurs near Moravia. *M. F. Merchant.*

PLANTAGO LANCEOLATA, *L.*

A singular form was found by Mrs. Rust near Syracuse. It had a compound spike, ovate in outline. The branches were short and densely crowded. It appeared as if many of the flowers had been transformed into short branches.

POTAMOGETON AMPLIFOLIUS, *Tuckm.*

This fine large species is plentiful in Warner's lake, East Berne. *P. pusillus, P. pectinatus* and both varieties of *P. gramineus* also abound there.

SMILAX HISPIDA, *Muhl.*

Flowering specimens were found in Cicero swamp, Onondaga county, by Mrs. Rust.

CALOPOGON PULCHELLUS, *R. Br.*

A white-flowered form. Syracuse. *Mrs. M. C. Still.*

JUNIPERUS VIRGINIANA, *L.*

This tree is common along the Hudson river from Albany to West Point. It here has a peculiar aspect. The branches are very numerous and frequently diverge from the trunk at a small angle. They afford a dense spray beautifully symmetrical in outline and having nearly the form of an elongated cone. Its beauty of figure renders it a very desirable acquisition for the adornment of parks, court-yards and ornamental grounds. It is freely attacked by three species of fungus, one of which produces oblong or spindle-shaped swellings in the branches and which probably has something to do in determining the peculiar aspect of these trees. The other two produce the subglobose galls which are commonly known as "Cedar apples." These fungi do not appear to destroy the life of the tree, though they cling to it year after year as a parasite.

BROMUS TECTORUM, *L.*

This beautiful introduced grass has become common all along the Hudson River railroad between Albany and Cold Spring and probably still farther south. Railroads are very effective agents in the dissemination and distribution of many plants.

CORTINARIUS IODES, *B. & C.*

The pileus in this species is sometimes spotted with white. The bulbous white stem is adorned with lilac-colored fibrils.

LENZITES SEPIARIA, *Fr.*

This species usually inhabits wood of coniferous trees, but it sometimes occurs on other wood. It was found near Albany in company with *Lenzites vialis* on a prostrate trunk of the necklace poplar or cottonwood, *Populus monilifera*. It has occurred also on willow, *Salix discolor*.

Stereum rugosum, *Fr.*

Well-developed specimens occurred near East Berne. The margin was narrowly reflexed, blackish and zonate. A cupulate form was also found.

New York Carices.

Since the publication of the New York State Flora, several changes in the nomenclature of the genus Carex have been made. A revised list of the New York Carices is here given, the names in the left-hand column being those adopted by Dr. Torrey in the New York State Flora; those in the right-hand column are the names applied to the same species in the last edition of Gray's Manual.

Names in N. Y. S. Flora.	Names in Gray's Manual.
Carex dioica, *L.*	Carex gynocrates, *Wormsk.*
C. exilis, *Dew.*	C. exilis, *Dew.*
C. pauciflora, *Lightf.*	C. pauciflora, *Lightf.*
C. polytrichoides, *Muhl.*	C. polytrichoides, *Muhl.*
C. Willdenovii, *Schk.*	C. Willdenovii, *Schk.*
C. Backii, *Boott.*	C. Backii, *Boott.*
C. disperma, *Dew.*	C. tenella, *Schk.*
C. chordorhiza, *Ehrh.*	C. chordorhiza, *Ehrh.*
C. cephalophora, *Muhl.*	C. cephalophora, *Muhl.*
C. Muhlenbergii, *Schk.*	C. Muhlenbergii, *Schk.*
C. siccata, *Dew.*	C. siccata, *Dew.*
C. rosea, *Schk.*	C. rosea, *Schk.*
C. retroflexa, *Muhl.*	C. retroflexa, *Muhl.*
C. sparganioides, *Muhl.*	C. sparganioides, *Muhl.*
C. stipata, *Muhl.*	C. stipata, *Muhl.*
C. vulpinoidea, *Mx.*	C. vulpinoidea, *Mx.*
C. setacea, *Dew.*	
C. bromoides, *Schk.*	C. bromoides, *Schk.*
C. alopecoidea, *Tuckm.*	C. alopecoidea, *Tuckm.*
C. Sartwellii, *Dew.*	C. disticha, *Huds.*
C. teretiuscula, *Good.*	C. teretiuscula, *Good.*
C. decomposita, *Muhl.*	C. decomposita, *Muhl.*
C. trisperma, *Dew.*	C. trisperma, *Dew.*
C. Deweyana, *Schw.*	C. Deweyana, *Schw.*
C. canescens, *L.*	C. canescens, *L.*
C. can. v. sphærostachya.	C. can. v. vitilis.
C. stellulata, *Good.*	C. stellulata, *L.*
C. stell. v. sterilis.	C. sterilis, *Willd.*
C. stell. v. scirpoides.	C. stell. v. scirpoides.
C. tenuiflora, *Wahl.*	C. tenuiflora, *Wahl.*
C. scoparia, *Schk.*	C. scoparia, *Schk.*
C. scop. v. lagopodioides.	C. lagopodioides, *Schk.*
C. straminea, *Schk.*	C. straminea, *Schk.*
C. stram. v. fœnea.	C. fœnea, *Willd.*
C. stram. v. moniliformis.	C. fœn. v.? sabulonum.

Names in N. Y. S. Flora.	Names in Gray's Manual.
Carex stram. v. festucacea.	Carex stram. v. festucacea.
C. stram. v. cristata.	C. cristata, *Schw.*
C. stram. v. mirabilis.	C. crist. v. mirabilis.
C. pedunculata, *Muhl.*	C. pedunculata, *Muhl.*
C. squarrosa, *L.*	C. squarrosa, *L.*
C. Buxbaumii, *Wahl.*	C. Buxbaumii, *Wahl.*
C. triceps, *Mx.*	C. triceps, *Mx.*
C. virescens, *Muhl.*	C. virescens, *Muhl.*
C. gracillima, *Schw.*	C. gracillima, *Schw.*
C. formosa, *Dew.*	C. formosa, *Dew.*
C. Davisii, *Schw. & Torr.*	C. Davisii, *Schw. & Torr.*
C. rigida, *Good.*	C. rigida v. ? Bigelovii.
C. angustata, *Boott.*	C. stricta, *Lam.*
C. cæspitosa, *L.?*	C. vulgaris, *Fr.*
C. aquatilis, *Wahl.*	C. aquatilis, *Wahl.*
C. aurea, *Nutt.*	C. aurea, *Nutt.*
C. crinita, *Lam.*	C. crinita, *Lam.*
C. oligosperma, *Mx.*	C. oligosperma, *Mx.*
C. bullata, *Schk.*	C. bullata, *Schk.*
C. bull. v. cylindracea.	C. monile, *Tuckm.*
C. cylindrica, *Tuckm.*	C. Tuckermani, *Boott.*
C. utriculata, *Boott.*	C. utriculata, *Boott.*
C. subulata, *Mx.*	C. subulata, *Mx.*
C. folliculata, *L.*	C. folliculata, *L.* C. rostrata, *Mx.*
C. intumescens, *Rudge.*	C. intumescens, *Rudge.*
C. int. v. globularis.	C. Grayii, *Carey.*
C lupulina, *Muhl.*	C. lupulina, *Muhl.*
C. lup. v. polystachya.	C. lupuliformis, *Sartw.*
C. scabrata, *Schw.*	C. scabrata, *Schw.*
C. Schweinitzii, *Dew.*	C. Schweinitzii, *Dew.*
C. retrorsa, *Schw.*	C. retrorsa, *Schw.*
C. tentaculata, *Muhl.*	C. tentaculata, *Muhl.*
C. hystricina, *Willd.*	C. hystricina, *Willd.*
C. Pseudo-Cyperus, *L.*	C. Pseudo-Cyperus, *L.* C. comosa, *Boott.*
C. longirostris, *Torr.*	C. longirostris, *Torr.*
C. trichocarpa, *Muhl.*	C. trichocarpa, *Muhl.*
C. aristata, *R. Br.*	C. aristata, *R. Br.*
C. umbellata, *Schk.*	C. umbellata, *Schk.*
C. Pennsylvanica, *Lam.*	C. Pennsylvanica, *Lam.*
C. Penn. v. Muhlenbergii.	C. varia, *Muhl.*
C. Novæ-Angliæ, *Schw.*	C. Novæ-Angliæ, *Schw.*
C. filiformis, *L.*	C. filiformis, *L.*
C. lanuginosa, *Mx.*	C. lanuginosa, *Mx.*
C. vestita, *Willd.*	C. vestita, *Willd.*
C. pubescens, *Muhl.*	C. pubescens, *Muhl.*
C. limosa, *L.*	C. limosa, *L.*
C. lim. v. irrigua.	C. irrigua, *Sm.*
C. livida, *Willd.*	C. livida, *Willd.*
C. flava, *L.*	C. flava, *L.*
C. Œderi, *Ehrh.*	C. Œderi, *Ehrh.*
C. pallescens, *L.*	C. pallescens, *L.*
C. Torreyi, *Tuckm.*	C. Torreyi, *Tuckm.*
C. striata, *Mx.*	C. polymorpha, *Muhl.*
C. granularis, *Muhl.*	C. granularis, *Muhl.*
C. laxiflora, *Lam.*	C. grisea, *Wahl.*
C. conoidea, *Schk.*	C. conoidea, *Schk.*
C. digitalis, *Willd.*	C. digitalis, *Willd.*

Names in N. Y. S. Flora.	Names in Gray's Manual.
Carex oligocarpa, *Schk.*	Carex oligocarpa, *Schk.*
C. olig. v. major.	C. Hitchcockiana, *Dew.*
C. tetanica, *Schk.*	C. tetanica, *Schk.*
C. anceps, *Willd.*	C. laxiflora, *Lam.*
C. blanda, *Dew.*	C. lax. v. blanda.
C. Crawei, *Dew. mss.*	C. Crawei, *Dew.*
C. plantaginea, *Lam.*	C. plantaginea, *Lam.*
C. Careyana, *Torr.*	C. Careyana, *Torr.*
C. eburnea, *Boott.*	C. eburnea, *Boott.*
C. flexilis, *Rudge.*	C. flexilis, *Rudge.*
C. arctata, *Boott.*	C. arctata, *Boott.*
C. debilis, *Mx.*	C. debilis, *Mx.*
C. miliacea, *Muhl.*	C. miliacea, *Muhl.*
C. lacustris, *Willd.*	C. riparia, *Curtis.*

The list derived from the Flora of New York comprises ninety-one species and fifteen varieties, which in the Manual are regarded as one hundred and one species and six varieties. Representatives of the following species and varieties have been added to the Herbarium since the publication of the Flora:

Carex scirpoidea, *Mx.*
C. Steudelii, *Kunth.*
C. sychnocephala, *Carey.*
C. alata, *Torr.*
C. adusta, *Boott.*
C. torta, *Boott.*
C. aperta, *Boott.*
C. lenticularis, *Mx.*
C. gynandra, *Schw.*
C. platyphylla, *Carey.*
C. Richardsonii, *R. Br.*
C. Sullivantii, *Boott.*
C. striata, *Mx.*
C. Houghtonii, *Torr.*
C. extensa, *Good.*
C. glaucodea, *Tuckm.*
C. tentaculata v. gracilis, *Boott.*
C. tent. v. altior, *Boott.*
C. tent. v. unispicata, *Pk.*
Carex capillaris, *L.*
C. retrocurva, *Dew.*
C. Muhlenbergii v. enervis, *Boott.*
C. teretiuscula v. major, *Koch.*
C. vulpinoidea v. platycarpa, *Olney.*
C. rosea v. radiata, *Dew.*
C. scoparia v. minor, *Boott.*
C. adusta v. sparsiflora, *Olney.*
C. straminea v. tenera, *Boott.*
C. stram. v. aperta, *Boott.*
C. stram. v. Crawei, *Boott.*
C. stricta v. strictior, *Gr.*
C. stricta v. xerocarpa, *Gr.*
C. laxiflora v. intermedia, *Boott.*
C. laxiflora v. plantaginea, *Boott.*
C. laxiflora v. latifolia, *Boott.*
C. retrorsa v. Hartii, *Gr.*
C. lupulina v. gigantoidea, *Dew.*
C. Emmonsii v. elliptica, *Boott.*

The whole number of species now known to inhabit the State is one hundred and nineteen. Adding to these the twenty-six varieties whose names are given in the preceding list and we have a total of one hundred and forty-five species and varieties.

(6)

NEW YORK SPECIES OF LEPIOTA.

"White-spored, hymenophorum distinct from the stem, veil universal, concrete with the epidermis of the pileus. Lamellæ free, often remote, neither sinuate nor decurrent." — *Hymen. Europ.*, p. 29.

The word Lepiota has reference to the scaly character of the pileus. The species grouped under this name may be distinguished from the species of Amanita by the character of the scales of the pileus, which in that subgenus are wart-like and superficial and for the most part easily separable from the pileus, while in this they are intimately united to the cuticle, which usually breaks up into scales or scale-like fragments. On the other hand they are distinguished from the species of Armillaria by the lamellæ which in most of the species do not reach the stem but are wholly free from it. In the few instances in which they reach the stem they are but slightly attached to it, and not sinuate or decurrent as in Armillaria.

The species are mostly of medium size, though *Agaricus procerus* has few rivals in length of stem, and *A. Morgani* in breadth of pileus. The pileus is soft and fleshy but generally rather thin. The cuticle, which is usually entire in the very young plant, soon breaks up into scales which are appressed or erect, large or small, fibrillose, floccose, granular or mealy according to the species. These scales often give an ornamental or variegated appearance to the pileus which is quite attractive. In form, the pileus in the young plant is subglobose or ovate, then it becomes convex or campanulate and finally in many species it is nearly flat with a central prominence or umbo. This umbo in such species as *A. procerus* and *A. mastoideus* is especially prominent.

The lamellæ are white or whitish in most of the species. Occasionally they may be tinged with yellow and in a few species they assume a smoky-red or pinkish-brown hue in old age or in drying. In *A. Badhami*, *A. meleagris* and *A. Americanus* the whole plant changes color when wounded or in drying.

The stem in most of the species is rather slender and either hollow or stuffed with webby or cottony filaments. The annulus or ring that is attached to and surrounds the stem is sometimes slight and disappears in very wet weather or in old age. The spores, which are normally white, sometimes assume a yellowish hue when kept a long time. *A. Morgani*, an Ohio species, is remarkable for producing spores of a bright-green color which soon fades to a dull-green. The spores vary much in size in the different species and afford, in several instances, excellent specific characters. *A. procerus* has very large spores, *A. cristatus* small ones and *A. metulæsporus* long ones.

Several of the species occur in woods and are especially fond of a loose soil composed chiefly of decayed vegetable matter, others grow in open grassy places, in fields, gardens and cultivated grounds. A few are occasionally found on old stumps and much decayed wood. *A. acutesquamosus*, *A. cepæstipes*, and some others are sometimes found growing in conservatories.

None of our species are reputed to be poisonous, yet only two, *A. procerus* and *A. naucinoides*, have been reported edible.

Fries divides this subgenus into two primary sections, the first containing the species with a dry pileus, the second, those with a viscid pileus. The first section, which has by far the greater number of species, is subdivided into five groups, all but one of which are represented in our flora. Of the Mesomorphi, "smaller, slender species with a hollow stem, a dry pileus and an entire, not granulose lacerated cuticle," we have not yet detected any representatives.

We have followed the system of Fries in our arrangement of the species.

SYNOPSIS OF THE SPECIES.

1. Pileus dry		2
2. Pileus with the margin even		3
3. Annulus movable, stem more than five inches long	A. procerus.	
3. Annulus not movable, stem less than five inches long,		4
4. Pileus smooth, lamellæ becoming pinkish-brown	A. naucinoides.	
4. Pileus rough with erect acute scales		5
5. Lamellæ crowded, some of them forked	A. Friesii.	
5. Lamellæ close, simple	A. acutesquamosus.	
4. Pileus with fibrillose, floccose or appressed scales		6
6. Scales reddish or reddish-brown		7
7. Scales soon disappearing from the margin	A. cristatus.	
7. Scales everywhere persistent	A. rubrotinctus.	
6. Scales blackish or blackish-brown		8
8. Stem short, bulbous	A. fuscosquameus.	
8. Stem rather long, not bulbous	A. felinus.	
6. Scales pale yellow	A. alluviinus.	
4. Pileus with granular, branny or mealy scales		9
9. Pileus rusty-yellow or reddish-yellow, lamellæ adnexed	A. granulosus.	
9. Pileus ochraceous-yellow, lamellæ adnate	A. amianthinus.	
9. Pileus dingy-white or brownish	A. pusillomyces.	
9. Pileus white	A. cristatellus.	
2. Pileus with the margin striate or substriate		10
10. Stem enlarged above the base		11
11. Plant becoming brownish-red in drying	A. Americanus.	
11. Plant not becoming brownish-red in drying	A. cepæstipes.	
10. Stem not enlarged above the base	A. metulæsporus.	
1. Pileus viscid		12
12. Pileus white	A. illinitus.	
12. Pileus alutaceous or dingy-yellow	A. oblitus.	

CUTICLE OF THE PILEUS DRY.

PROCERI.

Annulus persistent, movable, distinct from the volva.

This tribe is distinguished by its species having a well-developed annulus, which soon breaks loose from its attachment to the stem and thus forms a movable ring upon it, and a distinct cavity or depression in the pileus beneath the umbo for the reception of the stem.

The only representative thus far found in our State is *A. procerus*, but *A. rhacodes*, *A. excoriatus*, *A. mastoideus* and *A. Morgani* have been reported from neighboring States and will probably yet occur in our limits. All the European species of this tribe are classed by Fries as edible.

AGARICUS PROCERUS, *Scop.*

Tall Agaric. Parasol Mushroom.

Pileus at first ovate, then broadly convex or expanded, *strongly umbonate,* scaly or spotted from the breaking up of the cuticle, whitish alutaceous or brownish, the deflexed margin generally silky-fibrillose, the flesh soft, white; lamellæ close, free or remote, whitish, sometimes tinged with yellow or pink ; *stem tall,* cylindrical or slightly tapering upward, bulbous, hollow, squamose or furfuraceous, colored like the pileus, sometimes spotted, the annulus thick, firm, *movable,* white ; *spores large,* elliptical, ·00055 —·0007′ long, ·00035—·00045′ broad.

Plant 5′—10′ high; pileus 3′—6′ broad; stem 4″—6″ thick.

Fields, pastures, roadsides and occasionally in woods. July to September.

This Agaric resembles a parasol in shape, whence the popular name. It is easily distinguished from the allied species by its long stem, movable ring and prominent umbo. Generally the scales of the pileus are rather broad and distant from each other toward the margin, but closer toward the umbo on which the cuticle usually remains unruptured. For this reason the umbo is generally darker colored than the rest of the pileus. Sometimes the scales are appressed and spot-like, again they are slightly reflexed and then they give a rougher appearance to the pileus. They may be brownish, tawny-brown or reddish-brown in color. They often disappear almost wholly from the margin of the pileus which then has a whitish silky appearance. The stem is remarkable for its great length when compared with its thickness and is suggestive of the specific name, *procerus*. In extreme cases it is nearly or quite a foot long, though rarely more than half an inch thick. In a dried specimen before me the stem is nine inches long and one-fourth of an inch thick. The surface of the stem is in many cases merely scurfy, in others it is scaly from the cracking of the cuticle into small areas or fragments. Rarely it has a spotted appearance. Generally the plant grows singly, but sometimes it forms large tufts or clusters.

Fries remarks that its odor and taste are pleasant and that it is edible but tough. Probably for esculent purposes it would be better to use only the younger plants.

CLYPEOLARII.

Annulus persistent, fixed, homogeneous with the universal veil which coats the stem.

In this tribe the annulus does not become movable on the stem and the fibrils or scales of the veil clothe that part of the stem which is below the annulus and the exterior or lower surface of the annulus also. The species are mostly small or of medium size and some possess a distinct odor.

AGARICUS FRIESII, *Lasch.*

Fries' Agaric.

"Pileus fleshy, soft, lacerated into *appressed tomentose scales;* stem hollow, with a webby pith, subbulbous, squamose; annulus superior, pendulous, equal; lamellæ subremote, linear, crowded, branched."—*Hymen. Europ.*, p. 31.

Pileus fleshy but rather thin, convex or nearly plane, clothed with a soft tawny or brownish-tawny tomentum which breaks up into appressed often subconfluent scales, the disk rough with small acute erect scales, flesh soft, white; lamellæ *narrow, crowded,* free, white, *some of them forked;* stem equal or slightly tapering upward, subbulbous, hollow, colored like the pileus below the annulus and there clothed with soft tomentose fibrils which sometimes form floccose or tomentose scales, white and pruinose above, annulus well-developed, flabby, white above, tawny and floccose-scaly below; spores .00028′—.00032′ long, .00012′—.00016′ broad.

Plant 2′—5′ high; pileus 1′—4′ broad; stem 2—5″ thick.

Soft loose soil in woods and low bushy places. July—September. Catskill mountains and East Worcester.

I have quoted the description of this species as it is given in Epicrisis, because the American plant which I have referred to it does not in all respects agree with this description, but comes so near it that it can scarcely be specifically distinct. In the American plant, so far as I have seen it, erect acute scales are always present, especially on the disk, and the tomentum of the pileus does not always break up into distinct areas or scales. Neither is the stem usually scaly but rather clothed with soft tomentose or almost silky fibrils. The lamellæ are crowded and some of them are forked. At the furcations there are slight depressions which interrupt the general level of the edges and give them the appearance of having been eaten by insects. The plant has a slight odor, especially when cut or bruised.

AGARICUS ACUTESQUAMOSUS, *Wein.*

Acute-scaled Agaric.

"Pileus fleshy, obtuse, at first *hairy-floccose,* then *bristly with erect acute squarrose scales ;* stem somewhat stuffed, stout, bulbous, pruinose above the moderate-sized annulus ; lamellæ approximate, lanceolate simple." — *Hymen. Europ.*, p. 31.

Pileus convex or nearly plane, obtuse or broadly subumbonate clothed with a soft tawny or brownish-tawny tomentum which usually breaks up into imperfect areas or squamæ, rough with erect acute scales which are generally larger and more numerous on the disk ; lamellæ close, free, white or yellowish ; stem equal, hollow or stuffed with webby filaments, subbulbous ; spores about .0003′ long, .00012′ —.00016′ broad.

Plant of the same size as the last.

Woods and conservatories. Buffalo, *G. W. Clinton.* Albany, *A. F. Chatfield.* Adirondack mountains and Brewerton.

Fries remarks that this species agrees so closely with the preceding one that he thinks the two should be united. The chief differences set forth in the descriptions already quoted consist in the appressed, tomentose scales and branched lamellæ of the one and the erect acute scales and simple lamellæ of the other. Now in the American plants I find erect acute scales on all the specimens, both those with branched and those with simple lamellæ, so that the difference between the two forms is reduced with us to that of the lamellæ alone. It is therefore probable that they will have to be united. The form found in the hot houses seems to have the tomentum of the pileus less dense and the erect scales more numerous than in the form growing in woods. The annulus is frequently lacerated. In the specimens of the woods the erect scales are sometimes blackish in color, and they then contrast quite conspicuously with the tawny or brownish-tawny tomentum beneath them. They vary in size and shape. Some resemble pointed papillæ, others, being more elongated, are almost spine-like. These are sometimes curved. They are generally larger and more numerous on the disk than elsewhere, and often they are wholly wanting on the margin.

AGARICUS CRISTATUS, *A. & S.*

Crested Agaric.

Pileus thin, campanulate or convex, then nearly plane, *obtuse*, at first with an even reddish or reddish-brown surface, then *white adorned with reddish or reddish-brown* scales formed by the breaking up of the cuticle, the central part or disk colored like the scales; lamellæ close, free, white; stem slender, hollow, equal, smooth or silky-fibrillose below the ring, whitish, annulus small, white; spores *oblong* or *narrowly subelliptical*. .0002′ — .00028′ long, .00012′ — .00015′ broad.

Plant 1′ — 2′ high; pileus .5′ — 1.5′ broad; stem 1″ — 2″ thick.

Grassy places and borders of woods. June — September.

This species is easily known by its small size and the crested appearance of the white pileus, an appearance produced by the orbicular unruptured portion of the cuticle that remains like a colored spot on the disk. The fragments or scales are more close near this central part and more distant from each other toward the margin, where they are often wholly wanting. The scales are sometimes very small and almost granular. In very wet weather the margin of the pileus in this and some other species becomes upturned or reflexed.

The spores when viewed in one position appear as if truncated at one end and acute or pointed at the other, in another position they appear narrowly elliptical, the truncate end being slightly rounded. The spores of *A. Friesii* are somewhat similar in shape but are a little longer.

The plant usually has a distinct odor.

AGARICUS RUBROTINCTUS, *Pk. n. sp.*

Red-tinted Agaric.

Pileus thin, convex or nearly plane, sometimes slightly and broadly umbonate, at first even with a reddish or pinkish surface, a little darker and sometimes slightly rough on the disk, then adorned with appressed scales formed by the breaking up of the cuticle; lamellæ close, free, white or whitish; stem hollow, equal or slightly thickened at the base, smooth or slightly silky-fibrillose below the annulus, whitish, the annulus *well developed, membranous*, white or pinkish, *persistent*; spores *subelliptical, uninucleate*, .00035′ — .00045′ long, .0002′ — .00025′ broad.

Plant 1.5′ — 3.5′ high; pileus 1′ — 2.5′ broad; stem 2″ — 3″ thick.

Thin woods and open places. July — September. Helderberg mountains and East Worcester.

When young this Agaric closely resembles the preceding one from which it is distinguished by its larger size, more scaly and less white pileus, larger and more persistent annulus and larger spores. The cuticle sometimes remains entire and sometimes cracks in a radiating manner toward the margin, thereby giving to the pileus a sort of fibrillose or virgate appearance. The annulus sometimes partly breaks from its attachment to the stem and becomes almost movable.

AGARICUS FELINUS, *Pers.*

Cat Agaric.

Pileus thin, subcampanulate or convex, subumbonate, adorned with numerous *subtomentose* or *floccose blackish-brown scales;* lamellæ close, free, white; stem *slender, rather long*, equal or slightly tapering upward, hollow, clothed with soft loose floccose filaments, brown, annulus slight, evanescent; spores elliptical, ·00025′—·0003′ long, ·00016′—·0002′ broad.

Plant 2′—3·5′ high; pileus ·5′—1·5′ broad; stem 1″—2″ thick.

Woods. Adirondack mountains. August and September.

This is not a common species with us, having occurred thus far only in the woods of our mountainous regions. The scales or adornments of the pileus are similar in character to those of *A. Friesii*, but are much darker in color. Fries unites this Agaric with *A. clypeolarius* as a variety, but says that it is so frequent and so constant in the pine woods of Europe that it deserves to be noticed separately. It is easily distinguished from *A. rubrotinctus* by the darker color of the scales of the pileus, by the loose floccose filaments that clothe the brown stem, by the fugacious annulus and the smaller spores.

AGARICUS FUSCOSQUAMEUS, *Pk.*

Brown-scaled Agaric.

Pileus rather thin, hemispherical or convex, subumbonate, adorned with numerous *substrigose, erect* or *reflexed blackish-brown scales;* lamellæ close, free, white; stem *short, rather stout*, equal, hollow or stuffed with a cottony pith, clothed with loose soft dingy floccose filaments, *bulbous*, brown; annulus slight, evanescent; spores narrowly elliptical, ·00025′—·0003′ long, ·00012′—·00015″ broad.

Plant 2′—3′ high; pileus 1·5′—2·5′ broad; stem 3″—4″ thick.

Pine and hemlock woods. Croghan. September.

This species is closely related to the preceding one, and might, perhaps, be considered a variety of it. It has the same color, but is distinguished by its more strigose erect scales, its short but stouter bulbous stem, broader pileus and narrower spores. It is apparently very rare, having been detected only in the locality here given.

AGARICUS ALLUVIINUS, *Pk., n. sp.*

Alluvial Agaric.

Pileus thin, convex or plane, sometimes reflexed on the margin, *white, adorned with minute pale-yellow hairy or fibrillose scales;* lamellæ thin, close, free white or yellowish; stem slender, fibrillose, whitish or pallid, slightly thickened at the base, annulus slight, subpersistent, often near the middle of the stem; spores elliptical, ·00025′—·0003′ long, ·00016′—·0002′ broad.

Plant 1′—2′ high; pileus ·5′—1′ broad; stem 1″—1·5″ thick.

Alluvial soil, among weeds. Albany. July.

In the fresh plant the scales are of a pale-yellow or lemon color, but in drying they and the whole pileus take a deeper rich yellow hue. The annulus is generally remote from the pileus, sometimes even below the middle of the stem.

AGARICUS METULÆSPORUS, *B. and Br.*

Long-spored Agaric.

Pileus thin, campanulate or convex, subumbonate, at first with a uniform pallid or brownish surface, which soon breaks up into *small brownish scales,* the *margin more or less striate,* often appendiculate with fragments of the veil; lamellæ close, free, white; stem slender, equal or slightly tapering upward, hollow, adorned with soft loose floccose scales or filaments, pallid, annulus slight, evanescent; spores *long, subfusiform,* ·00055′—·00075′ long, ·00025′—·0003′ broad.

Plant 2′—3·5′ high; pileus ·5′—1·5′ broad; stem 1″—2″ thick.

Woods. Adirondack mountains. August and September.

This species occurs with us in the same localities as *A. felinus,* which it very much resembles in size, shape and general characters, differing only in color, the striate margin of the pileus and the character of the spores. Both were at first taken to be forms of *A. clypeolarius,* and were included in the description of that species in Report 23, p. 72. Judging from the published descriptions of *A. clypeolarius,* it is probable that in Europe also it has been made to include forms which will yet be considered distinct species. In Epicrisis it is said to "vary wonderfully in size and color," and in the Hand-book of British Fungi the pileus is said to be "white, yellow, pink, rufous, brown, etc." In Icones Selectæ, Fries figures what he considers the typical form of the species, a form which I have not observed here, and which probably does not occur with us. It is a little remarkable that none of the published descriptions and figures of this species, so far as I have seen them, give the spore characters. Those characters are often of the utmost value in distinguishing closely related species. In regard to the spores of *A. metulæsporus*, the descriptions do not all agree, but the discrepancies are probably due to variability in the spores and to lack of care in the examination. In Epicrisis they are said to be twice as large as in the allied species, and acutely pointed at one end. In Grevillea, Vol. I, p. 55, they are said to be nine-pin shaped or obliquely clavate. In Mycological Illustrations, by M. C. Cooke, they are represented as fusiform and acute at both ends. In our plant they are nearly fusiform in shape, but varying somewhat in the character of the apices, which are sometimes acute, sometimes blunt, and sometimes acute at one end and blunt at the other. The species has a wide range, having been found in Ceylon, England and Alabama.

ANNULOSI.

Annulus superior, fixed, subpersistent, universal veil adnate to the pileus.

The species of this tribe are chiefly distinguished by the well-developed but fixed and rather persistent annulus. They are generally larger and more fleshy than those of the preceding tribe. In some species the lamellæ, and in others the whole plant changes color in drying.

AGARICUS CEPÆSTIPES, *Sow.*

Onion-stemmed Agaric.

Pileus thin, at first ovate, then campanulate or expanded, umbonate, soon adorned with numerous *minute brownish scales* which are often *granular or mealy, plicate striate* on the margin, white or yellow, the umbo darker; lamellæ thin, close, free, white, becoming dingy with age or in drying; stem rather long, tapering toward the apex, generally *enlarged in the middle or near the base*, hollow, annulus thin, subpersistent; spores subelliptical, uninucleate, .0003′—.0004′ long, .0002′—.0003′ broad.

Plant often cæspitose, 2′—4′ high; pileus 1′—2′ broad; stem 2″—3″ thick.

Rich ground and decomposing vegetable matter. Also in graperies and conservatories. Buffalo, *G. W. Clinton*. Albany, *A. F. Chatfield*.

The species takes its name from the peculiar oblong swelling or enlargement in the middle or the lower part of the stem. It is similar to the enlargement in the flowering stem of an onion. The plants sometimes occur in tufts or clusters of many individuals. When very young the pileus is ovate and of a uniform color, but the surface soon breaks up into minute scales which rest upon a white or whitish ground color. In drying the lamellæ generally assume a dingy or smoky hue, but the pileus does not generally change color. Two forms occur in hot-houses, the one having a white, the other a yellow pileus. The striations of the margin are rather deep and close and give a somewhat plicate appearance to that part of the pileus. The form that grows in the open air has shorter striations on the margin, and the stem is not so regularly enlarged in the middle, the enlargement being mostly near the base and sometimes wanting entirely. Possibly this form may be the *A. rorulentus* Panizzi, but it seems to me too near *A. cepæstipes* to be separated.

AGARICUS AMERICANUS, *Pk.*

American Agaric.

Pileus rather fleshy, at first ovate, then convex or expanded, *umbonate*, more or less striate on the margin, the cuticle breaking up, except on the umbo, into *reddish or reddish-brown appressed scales*, white, flesh white; lamellæ rather broad, close, free, white, narrower toward the stem and there sometimes anastomosing; stem tapering upward, *enlarged at or a little above the base*, hollow, white, annulus rather large, but thin and flabby, sometimes separating from its attachment to the stem, occasionally evanescent; spores subelliptical, uninucleate, .0003′—.0004′ long, .0002′—.0003′ broad.

Plant sometimes cæspitose, 3′—5′ high; pileus 1.5′—4′ broad; stem 2″—5″ thick.

Lawns and grassy places, sometimes on decaying wood. July and August.

This species has many points of resemblance to the preceding one but it is larger, with a stouter stem and a more fleshy pileus, with much broader and more distinct scales. The stem is enlarged as in that species but the enlargement is generally at or near the base. When bruised the flesh changes color and in drying the whole plant assumes a dull brownish-red or smoky-red hue, a character by which the species may be easily distinguished. The European species, *A. Badhami* and *A. meleagris*, change color under similar circumstances, but the latter becomes red and the former saffron-red. They also differ in other respects from our plant. This has been found by Miss Banning near Baltimore, Maryland, with a pileus sometimes seven inches in diameter. She has observed that it sometimes exudes a reddish juice when cut or wounded. The striations of the margin vary in different plants, being sometimes distinct, sometimes obscure.

I have placed this species in the tribe Annulosi because of its relation to *A. cepæstipes*. It has also a close relation to the Proceri and might with almost equal propriety be placed among them. The annulus both in this and the next species occasionally loosens from the stem and becomes a movable ring.

AGARICUS NAUCINOIDES, *Pk.*

Smooth Agaric.

Pileus at first subglobose, then convex, fleshy, soft, *smooth*, rarely slightly squamulose or granular-mealy, white or smoky-white, flesh white; lamellæ rather broad, close, free, white, *slowly changing to a dingy pinkish-brown or smoky-brown color* with age or in drying; stem smooth or silky-fibrillose, equal or slightly thickened at the base, hollow, sometimes stuffed with webby filaments, white or smoky-white, annulus thick, persistent, white; spores subelliptical, uninucleate, .0003′ — .0004′ long, .0002′ — .0003′ broad.

Plant 2′ — 4′ high; pileus 1.5′ — 3.5′ broad; stem 3″ — 5″ thick.

Grassy grounds in pastures, fields and roadsides. Common. September—November.

This is a beautiful as well as a useful Agaric. It is very regular and symmetrical in shape and generally pure white in color. Its surface is usually very smooth and even, though occasionally a slight mealiness or granular roughness is developed on the disk and still more rarely a few minute scales appear. In a single instance I have seen the surface cracked into rather large thick scales, a result probably of unusually wet weather. The white color sometimes gives place to a dingy smoky-white or ashy hue. The lamellæ are at first white or cream-colored, but when old or dried they become smoky-brown or brownish tinged with pink. The stem is hollow, but, as in many other hollow-stemmed Lepiotæ, the cavity often contains webby or cottony filaments, especially when young. The plant occurs late in the season and is most often found in grassy pastures and in lawns, though sometimes it occurs in corn fields and other cultivated grounds. It is liable to be confused with white forms of the common edible mushroom, *A. campestris*, but in that species the lamellæ at first have a beautiful pink or flesh-colored hue which soon changes to a blackish-brown color. It also bears some resemblance to *A. lævis* and to *A. cretaceus*, but the former has flesh-colored and the latter brown spores. It is, however, more nearly related to its white-spored allies, *A. naucinus*, *A. Schulzeri* and *A. holosericeus.* If we may rely upon the published descriptions of these three species, the first one may be distinguished from our plant by its globose spores and granulated cuticle; the second by its ovate spores, small annulus, umbonate pileus and nauseous taste; the third by its silky-fibrillose pileus and solid stem. Some discrepancies exist in the published descriptions and figures of *A. naucinus*, to which our plant was first referred. See Report 23, p. 72, and Report 29, p. 66. In Berkeley's Outlines of British Fungology, page 94, the spores are characterized as "very large," but their shape is not given. In Cooke's Mycological Illustrations they are represented as globose, but small; in Epicrisis, page 34, they are described as globose, and in Michelia, Vol. VII, p. 229, their dimensions indicate a length greater than their breadth. It is probable, therefore, that two or more species have been confused by authors.

As an edible species, the smooth Agaric is not at all inferior to the common mushroom. Indeed, in some respects it is superior to it. It is as large, and its flesh is as thick and white, and no less tender and savory. Its keeping qualities are better, for in the common mushroom the lamellæ soon become blackish and repulsive, while in this one they retain their white color a long time, and do not become so dark-colored when they do change. It is also less liable to be infested by the larvæ of insects, and, growing as it generally does, among short grass, it is more clean and attractive in appearance. If it can be cultivated as easily as the common mushroom, it will make a very desirable and more marketable substitute for that species.

GRANULOSI.

The universal veil of the pileus and stem continuous, when ruptured forming a slight annulus.

The species of this tribe are mostly rather small, and have the pileus and stem coated with minute warts, granules or branny particles, rather than with ordinary scales. The lamellæ, in some of the species, reach the stem and are slightly attached to it. Such species serve to connect this subgenus with the following one.

AGARICUS GRANULOSUS, *Batsch.*

Granular Agaric.

Pileus thin, convex or nearly plane, sometimes almost umbonate, *rough with numerous granular or branny scales*, often radiately wrinkled, *rusty-yellow or reddish-yellow*, often growing paler with age, flesh white or reddish tinged; lamellæ close, rounded behind and usually *slightly adnexed*, white; stem equal or slightly thickened at the base, stuffed or hollow, white above the annulus, colored and adorned like the pileus below it, annulus slight, evanescent; spores, elliptical, ·00016′—·0002′ long, ·00012′—·00014′ broad.

Plant 1′—2·5′ high; pileus 1′—2·5′ broad; stem 1″—3″ thick.

Woods, copses and waste places. Common. August—October.

This is a small species with a short stem and granular reddish-yellow pileus, and lamellæ slightly attached to the stem, a character by which it differs from all the preceding. The annulus is very small and fugacious, being little more than the abrupt termination to the coating of the stem. The species was formerly made to include several varieties which are now regarded as distinct.

AGARICUS AMIANTHINUS, *Scop.*

Amianth Agaric.

Pileus thin, convex, subcampanulate or plane, often umbonate, *coated with numerous granular and furfuraceous scales, ochraceous-yellow*, sometimes radiately wrinkled, crenate-appendiculate on the margin; lamellæ rather broad, close, *adnate*, white or yellowish; stem rather long, slender, equal or slightly thickened at the base, stuffed or hollow, white above, colored like the pileus and floccose-squamulose below the slight evanescent annulus; spores elliptical, ·0002′—·00028′ long, about ·00016′ broad.

Plant 1·5′—4′ high; pileus 1′—1·5′ broad; stem 1″—2″ thick.

Damp, mossy ground and much decayed wood. Adirondack mountains. August and September.

This Agaric closely resembles the preceding one, of which it is sometimes regarded as a variety. It may be distinguished by its more ochraceous persistent color, appendiculate margin, elongated stem, and by its lamellæ, which are not rounded behind, but are attached to the stem by their whole breadth. The flesh is also more or less tinged with yellow. It prefers mossy, shaded ground under evergreen trees. The flocculent part of the veil is easily rubbed off and mostly disappears in drying. It is a pretty Agaric.

AGARICUS PUSILLOMYCES, *Pk.*

Small Agaric.

Pileus thin, subcampanulate or convex, subumbonate, *minutely granular or furfuraceous, whitish or brownish;* lamellæ broad, close, free, white; stem slender, equal, scarcely annulate, *rough with a granular mealiness*, colored like the pileus; spores elliptical, ·00016′—·0002′ long, ·00012′ broad.

Plant scarcely 1′ high; pileus 2″—4″ broad; stem about ·5″ thick.

Ground under brakes, *Pteris aquilina*. Lake Pleasant. August.

This very small Agaric is related by its granular pileus to *A. granulosus*, but its small size and different color at once distinguish it. It is apparently very rare, having been found but once.

AGARICUS CRISTATELLUS, *Pk.*

Little crested Agaric.

Pileus thin, convex, subumbonate, *minutely mealy*, especially on the margin, *white*, the disk slightly tinged with pink; lamellæ close, rounded behind, free, white; stem slender, whitish, hollow; spores subelliptical, ·0002′ long.

Plant the same size as the last.

Mossy places in woods. Copake. October.

This is distinguished from the last species by its white mealy pileus, narrower lamellæ and smooth stem. The margin is sometimes appendiculate with the minute fragments of the veil. The annulus is obsolete. The white pileus and pinkish tinge of the disk suggest a resemblance in color to *A. cristatus*. The species has been detected but once.

CUTICLE OF THE PILEUS VISCID.

AGARICUS ILLINITUS, *Fr.*

White-smeared Agaric.

Pileus rather thin, soft, at first ovate, then campanulate or expanded, subumbonate, *smooth*, *white*, very viscid or glutinous, even or striate on the margin; lamellæ close, free, white; stem equal or slightly tapering upward, stuffed or hollow, viscid, white; spores broadly elliptical, ·0002′ long, ·00016′ broad.

Plant 2′—4′ high; pileus 1′—2·5′ broad; stem 2″—3′ thick.

Thin or open woods. Adirondack mountains. July to September.

This is a smooth white species with the stem and pileus clothed with a clear viscid or glutinous veil. The margin of the pileus is often even, but the typical form of the species has it striate. The flesh is soft and white. The species may be distinguished from the viscid white species of Hygrophorus by the free, not adnate nor decurrent, lamellæ.

AGARICUS OBLITUS, *Pk.*

Smeared Agaric.

Pileus fleshy, convex or expanded, subumbonate, smooth or obscurely spotted or scaly from the breaking up of the veil, viscid, *alutaceous in-*

clining to tawny, the umbo generally darker; lamellæ crowded, free, whitish or yellowish, some of them forked; stem equal or slightly tapering upward, smooth at the top, *floccose* and viscid elsewhere, hollow or containing a cottony pith, annulus obsolete; spores elliptical, ·0002′—·00025′ long, ·00012′—·00016′ broad.

Plant 2′—3′ high; pileus 2′—3′ broad; stem about 3″ thick.

Frondose woods. Lowville. September.

This species is about equal in size to the preceding one, and equally viscid. It is distinguished by its colored pileus usually adorned by a few spot-like scales and by the floccose scales or filaments of the stem. It has been found but once.

In the preceding pages, a personal name added to the station of a plant indicates the collector or contributor. When no name is added to the station the plant was collected by the writer. Dates signify the time when the plant was collected, and indicate to some extent the time of its occurrence. In the monograph of the Lepiotæ they indicate the time when or during which the species has been observed. A single accent placed above and at the right of a figure should be read "inch" or "inches," according to circumstances; a double accent should be read "line" or "lines." A dash between two numbers is equivalent to the word "to."

Grateful acknowledgments are rendered to those botanists who have contributed specimens or information.

Very respectfully submitted.

CHARLES H. PECK.

ALBANY, *January* 4, 1882.

A LIST OF THE RHIZOPODA

FOUND IN THE

VICINITY OF ALBANY, N. Y.

In the present list I have admitted no species of which I was uncertain or on any ground but that of actual observation. My thanks are due to Prof. Joseph Leidy for his corrections to my manuscript.

D. N. DE TARR.

LIST OF SPECIES.

AMŒBA, *Ehrb.*

A. proteus, *Pall.*

This is very common, rather under the average size, but seems very active. Localities, Black-rock pond, Water-supply.

A. verrucosa, *Ehrb.*

Not common and I have seen specimens from but one locality. Locality, Black-rock pond.

A. radiosa, *Ehrb.*

Common in all stages. Localities, Island creek, Black-rock pond.

A. villosa, *Wallich.*

Rarely seen. Locality, Black-rock pond.

OURAMŒBA, *Leidy.*

O. vorax, *Leidy.*

Rare, movement very slow. Locality, Mill-pond (Kenwood).

O. botulicauda, *Leidy.*

Very rare, only a single specimen. Water-supply.

DIFFLUGIA, *Le Clerc.*

D. globulosa, *Duj.*

Common in many localities. Varies greatly in size but is quite constant in shape.

D. pyriformis, *Ptery.*

Our most common species. I have seen varieties 1, 2, 3 and 4, as given by Leidy, but have not found the forms connecting this species with *globulosa.*

D. urceolata, *Carter.*

Not common, generally typical in form. Locality, Island creek.

D. cratera, *Leidy.*

Rare; I have seen them living, therefore I could not be mistaken. Locality, Water-supply.

D. acuminata, *Ehrb.*

Rather common in the Albany basin.

D. lobostoma, *Leidy.*

Not common. Localities, Water-supply, etc.

D. corona, *Wall.*

Quite common during July and August. Locality, Water-supply.

D. constricta, *Ehrb.*

Rare. Localities, Black-rock pond and Botany pond.

D. spiralis.

Rare. Locality, Normanskill.

D. obliqua, *n. sp.* Figs. 1 and 2.

General outline of the shell elliptical, obtusely or acutely pointed at the vertex, to which is often attached a few granules of quartz. Shell constricted above the mouth. Perostome set at an angle to the long axis of the body. Color yellowish-brown.

This species is quite common at certain seasons in the Water-supply, but is only rarely found elsewhere. I have only two localities noted. Localities, Black-rock pond, Island creek.

HYALOSPHENIA, *Stein.*

H. tincta, *Leidy.*

Extremely rare. Locality, Island creek.

QUADRULA, *Schulze.*

Q. symmetrica, *Wall.*

Rare. Locality, Water-supply.

HELIOPERA, *Leidy.*

H. picta, *Leidy.*

Seldom seen. Locality, Black-rock pond.

ARCELLA, *Ehrb.*

A. discoides, *Ehrb.*

Not common. Locality, Botany pond.

A. vulgaris, *Ehrb.*

Very rare in most localities but common at Botany pond.

PSEUDODIFFLUGIA, *Schl.*

P. gracilis, *Schl.*

Common. Locality, Water-supply.

CYPHODERIA, *Schl.*

C. ampulla, *Ehrb.*

Common. Localities, Water-supply, Albany basin.

EUGLYPHA, *Dujardin.*

E. alveolata, *Duj.*

Common in all localities.

E. cilíata, *Ehrb.*

Not common. Locality, Water-supply.

TRINEMA, *Enchelys.*

T. enchelys, *Ehrb.*

Very rare. Locality, Black-rock pond.

ACTINOPHRYS, *Ehrb.*

A. sol, *Ehrb.*

Common everywhere that I have collected. I am convinced that two or more species are generally included under this name.

RADIOPHRYS, *Archer.*

R. viridis, *Archer.*

Seldom seen. Locality, Water-supply.

R. elegans, *H. & L.*

More common. Locality, Island creek.

ACTINOSPHÆRIUM, *Stein.*

A. eichornii, *Ehrb.*

Common. Locality, Water-supply.

CLATHRULINA, *Cienk.*

C. elegans, *Cienk.*

Extremely rare. Locality, Black-rock pond.

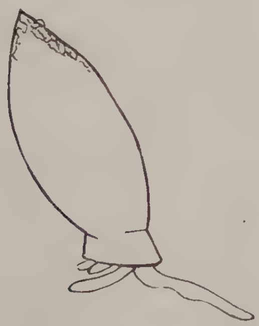


Fig. 1.

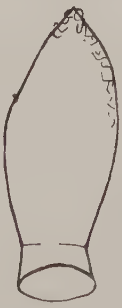


Fig. 2.

× 500 diameters.

ANATOMY AND PHYSIOLOGY

OF

ANODONTA FLUVIATILIS.

By George B. Simpson.

ANODONTA FLUVIATILIS.

Several years ago while making a collection of fresh-water shells, I naturally desired to know something of their anatomy and physiology. I found no book treating specially of that subject, though I found one or more chapters in several books, but to me they did not seem to be just what was needed by a beginner, the articles were either without illustrations or the illustrations were few and very poor. I have written this article with the hope that it may be of use to beginners, and also to some who have contented themselves with collecting the shells paying no attention to the living animal within. To those who are advanced in similar knowledge, this article may seem simple, but it must be remembered that very simple things are frequently formidable to beginners. I had intended to follow this article with others on the anatomy and physiology of other bivalve and univalve shells, but the delay in printing has been so great that I have not done so. At that time I was more interested in Unionidæ, and selected one of their number, *Anodonta fluviatilis,* for dissection and explanation.

By boiling the animal for a short time, the intestinal canal, nerves, arteries, etc., are much more easily found than by dissecting an alcoholic specimen; though the animal is distorted by boiling still a very good idea of the position of the different organs is formed, and the dissection of a specimen which has been kept in alcohol for some time is rendered much easier, the student knowing just where to look for the different organs: to dissect an animal just from the water would be almost if not quite impossible for a beginner. A very slight addition of chromic acid to the alcohol in which some of the animals are kept, will be of help in dissecting certain parts.

All dissections were made by myself, and all the drawings are directly from nature by myself; only in two or three instances has the microscope been used, nearly all the parts described can be seen without the use even of a simple lens.

The Anodonta consists of an outer part called the shell or exo-skeleton, and the animal inclosed within the shell. The shell is composed of two valves united dorsally by means of an elastic ligament.

The parts of the animal which will be described in detail are the mantle, gills, labial palpi, muscles, body, foot, viscera, nerves, liver, stomach, heart, pericardium, renal organ, vascular system and organs of generation.

When the shell of the Anodonta (and these remarks apply also to the genera Unio and Margaritana) is held with the ligament or attached portions of the shells upward, and the larger, most convex portion, the most distant from the eye, the valve at the right hand is called the right valve (Pl. 4, fig. 1, r.v.); that at the left, the left valve (Pl. 4, fig. 1, l. v.); the part the most distant from the eye, the anteror portion (Pl. 4, fig. 1, a. p.); the nearest to the eye, the posterior portion (Pl. 4, fig. 1, p. p.); the upper part the dorsal (Pl. 3, fig. 1, d. p.), and the lower part the ventral portion. Where the same letters occur on Pl. 3 as on Pl. 4, the same parts of the shell are designated. On the dorso-anterior portion of each valve is a more or less prominent, blunt elevation called the umbo or beak. (Pl. 3, fig. 1, umb.)

Posterior to the umbones, uniting the dorsal margins of the valves, is an elastic horny portion of the exo-skeleton, designated the ligament (Pl. 4, fig. 1, lig.), which antagonizes the action of the adductor muscles, and has a tendency to keep apart the ventral margins of the valves.

The ligament when the shell is open is of nearly equal thickness; when the shell is closed by the action of the adductor muscles, the outer portion of the ligament becomes stretched and the inner portion compressed and folded; when the muscles relax, the ligament assumes its natural form and in doing so draws apart the ventral margins of the shell.

The ligament is said to be external, though it is covered for about one-half of its width by an extension of the shell. This ligament is composed of two parts, the outer and thinner portion the epidermal, and the inner portion the cartilagenous, composed of both perpendicular and horizontal fibres.

The shell or exo-skeleton consists of three distinct layers, the outer one is designated as the epidermis (Pl. 4, fig. 3), and consists of a thin membrane which is uncalcified, that is, without lime in its composition, and varying in color from olive green to brown. Immediately beneath the epidermis is the prismatic layer (Pl. 4, figs. 4, 6, pr.), seemingly composed of solid prisms, but if this portion of the shell is placed in dilute acid the interior of each prism is dissolved, leaving the walls entire, showing that the layer is made by the deposition of calcareous matter in prismatic, generally hexagonal cavities, which are themselves formed by the superimposition of fenestrated laminæ, secreted by the margin of the mantle. (Pl. 4, fig. 6, pr.)

The third or inner layer of the shell is formed by the superimposition of very thin diagonal layers, which overlap each other and is known as nacre or the nacreous layer. (Pl. 4, figs. 5, 6, nac.)

The interior of the shell presents an irridescent appearance, which is caused by the refraction of the light by the edges of the overlapping layers. The prismatic portion being secreted by the edge of the mantle extends slightly beyond the nacreous portion. If any thin shell is held to the light the prismatic portion can easily be seen with the aid of a simple lens. Near the margin of the shell, the prismatic portion is the more prominent, while on all other portions the nacreous layer is thicker than the prismatic, generally from two to four times the thickness.

The epidermis (Pl. 4, fig. 3), shows no structure, though showing under the microscope pigment cells (Pl. 4, fig. 3, p.c.), being without lime in its composition, it serves to resist the action of carbonic acid gas, which is contained in greater or less quantities in all fresh water, and which, but for the protection of the epidermis, would destroy the nacreous and prismatic portions of the shell. On portions of the shell, generally the umbo, from being the longest exposed, where the epidermis has been worn away, the shell is often much eroded. The same conditions occur on other portions of the shell where by accident the epidermis has been broken away. Sometimes between the other layers the animal secretes a layer of epidermis, thus arresting the progress of erosion; layers occurring in this manner are usually colorless.

The formation of the shell, according to all or nearly all the writers on this subject, is not continuous, but occurs at successive periods; but this explanation is not entirely satisfactory. The secretion of the shell is involuntarily performed by the animal and can no more be arrested by the will of the animal than the formation of bone in the human body can be continued or not according to the will.

There are numerous elevations on the exterior of the shell; in thin shells these elevations have corresponding undulations in the interior. The shell of the Anodonta being usually very thin, the interior corresponds in form to the exterior. The Anodonta is without the teeth of the Unio or Margaritana, but below the ligament there are two thickened projections or rudimentary teeth. (Pl. 11, fig. 1, r.t.)

On the interior of the shell, near the anterior dorsal margin, is seen a comparatively large oval marking, caused by the attachment of the anterior adductor muscle (Pl. 11, fig. 1, a.a.); just posterior to this are two other impressions, one at the upper and the other at the lower portion; the upper one is caused by the attachment of the anterior retractor muscle (Pl. 11, fig. 1, a. r.), the lower one by the attachment of the protractor pedis muscle (Pl. 11, fig. 1, p. p.), and are known respectively as the anterior retractor and the protractor pedis muscular impressions.

At a short distance from the post-dorsal margin, near the angle formed by the junction of the hinge-line and posterior slope, is another large marking formed by the attachment of the posterior adductor muscle (Pl. 11, fig 1, p. a.), and is known as the posterior adductor muscular impression. Immediately anterior to the upper portion of this impression, is a smaller nearly circular impression, formed by the attachment of the posterior retractor muscle and is known as the posterior retractor muscular impression. (Pl. 11, fig. 1, p. r.) Extending from the umbo to each adductor muscular impression, is a faint, gradually enlarging marking, caused by the adductor muscles, forming continuous impressions as they changed their position with the advancing growth of the shell. (Pl. 11, fig. 1, mar.) Connecting the posterior and anterior muscular impressions is a line, corresponding in curvature with the ventral margin of the shell, known as the pallial line, and formed by the attachment of the mantle to the shell by means of numerous muscles along this line. (Pl. 11, fig. 1, p. l.; Pl. 5, fig. 1, p. l.) Near the umbo are several impressions caused by the attachment of adductor muscular fibres. (Pl. 11, fig. 1, m. f.)

The thickness of the shell varies in different localities, even when only a short distance apart, and does not depend upon the amount of lime (of which substance the shell is principally formed) in the water, but upon the power of the animal to absorb, and assimilate it into a shell; thin fragile specimens being found in water, rich in lime, and others more massive, in waters where that material is much less abundant. That the thickness of the shell is not due to the amount of lime in the water is shown by the fact that several species occur in the same stream, some having massive and others fragile shells; *Unio undulatus* having a shell one-fourth of one inch or more in thickness, and *Unio gracilis* with a shell one-twentieth of an inch in thickness, occur in the same locality. The conditions favorable for the development of one species may be unfavorable for the development of another, even of the same genus. In the canal at West Troy, N. Y., specimens of *Anodonta implicata* are found of very large size, the shells free from erosion, while *Anodonta fluviatilis*, though of frequent occurrence, is always small, seldom or never exceeding three inches in length, thin and much eroded. All the species occurring at this locality, with the exception of *A. fluviatilis*, viz., *A. implicata, U. complanatus, U. radiatus, U. ochraceous, U. cariosus* and *U. nasutus* occur in much better condition than in any other locality in this part of the State. In a pond situated less than a mile from this locality, *A. fluviatilis* is found of unusually large size and but slightly eroded ; specimens five inches in length, with a height of three inches and a diameter of two and one-half inches are abundant, and some are found measuring more than six inches in length and three and one-half inches in height, as large and perfectly preserved specimens as occur in any locality, while with the exception of this species there is not another shell, in the pond, either bivalve or univalve. In another locality a mile below Albany where *Sphærium rhomboideum* is found in abundance and of unusually large size, *Anodonta fluviatilis*, though of frequent occurrence, is very small ; the largest specimen I have seen, among a collection numbering many hundreds, measures two inches in length.

A. fluviatilis thrives best in ponds, but is found in quite rapid streams, though even then the most favorable localities are in the comparatively quiet portion of the stream.

The largest specimens I have seen, were found in the pond mentioned above, near the mouth of a sewer, where the mud was of a slimy character and offensive to the smell. It is claimed that the male and female may be distinguished by the comparative diameter and general shape of the shell, but I have not been able to so distinguish them. In the fall of 1879 I collected about one hundred and fifty specimens of varying size — the shells were of different shapes and proportions, some quite flat, others extremely gibbous, the diameter sometimes being greater than the height. Among the first sixty I opened, there was not a single male, the outer gills of each specimen being filled with young. The remaining specimens were placed in a tank, and for several months undisturbed ; when I removed these animals from the shells I found only four individuals without young in the outer gills, and as some of the animals had extruded a portion of the young from the gills, it is possible that the individuals above mentioned may have had the young in the gill pouches earlier in the season but had extruded them all. Though I am not prepared to say that the sexes are not distinct, the fact that nearly every specimen had young in the gills would seem to indicate that condition. When my attention was first called to it, it was too late to make any farther collections that season. The growth of an animal during a year, I have not been able to determine ; an individual which I have kept for ten months has gained in length in that time only one-fourth of an inch, but it seems probable that their growth in their natural habitat must be much greater than this.

In a certain locality in a stream near Albany, *Unio pressus* is quite abundant in a rapid portion, about two hundred feet in length. I have collected all the large specimens each year for three years. The water being so shallow that every portion of the bottom can be seen, and yet each year they appear equally abundant and of full size, showing that their growth must be quite rapid.

When out of water, and exposed to the sun, the Anodonta will live but a short time; placed in a cool, somewhat damp situation, life will continue for several days. Other members of the family Unionidæ are much more tenacious of life. According to DESHAYES, de Conch. pp. 81–84, a specimen of Anodonta from Cochin China reached Paris in a living condition after having been wrapped in dry paper for a period of more than eight months; similar instances are mentioned concerning *Unio litoralis* (Drap.), *Spatha rubens* (Lam.) and an Australian species of Unio, the last surviving two hundred and thirty-one days. None of those with which I have experimented have survived more than seven days, and the greater portion of them died within two or three days.

The popular belief that the removal of a bivalve from the shell is instantly fatal to the animal is erroneous. While making the drawings illustrating this article, I cut through the muscles attached to one of the valves, removing the valve; and, after some hours occupied in making the drawing (Pl. 5), I removed the animal entirely from the shell, cutting away the mantle from one side, and spent about an hour in noting the action of the ventricle and auricles. The action of the heart at this time, eight hours after the valve was removed, was full and regular.

The heart continues its action for a considerable time after all apparent muscular force has been lost. I once noticed in the tank one of the Anodontæ, to all appearances dead, the shell gaping, the foot protruding, no contraction occurring on handling, and no evidence of life apparent. Not having time to dissect it that day, I laid it away in cold water; about twenty-four hours afterward I removed the animal from the shell, not the slightest contraction occurring, and yet the heart was distinctly beating, though slowly.

THE MANTLE.

(Plate 6.)

If a shell be opened by inserting a knife between the valves and cutting, close to the shell, the anterior and posterior muscles, a thin, semi-transparent membrane will be observed completely investing the animal and lining the interior of the shell, extending between the rudimentary teeth of the Anodonta and the strong teeth of the Unio and Margaritana. This membrane is called the pallium or mantle.

The mantle is divided into two lobes, each one lining a single valve of the shell; they are united along the dorsal portion, and free along the ventral portion, and are pierced by the anterior and posterior adductor muscles.

The mantle is attached to the shell by small muscles near the umbones or beaks and along the pallial line.

The impressions left by the umbonal muscles on the shell are comparatively faint; those left by the muscles of the pallial line are frequently quite distinct. The edges of the mantle meet on the upper portion of the anterior adductor muscle, and shortly blend, showing the line of junction by a narrow, slightly elevated ridge, which continues for nearly one-half the distance to the posterior muscle, then becoming stronger, more elevated, gradually increasing in height and width to a point a little anterior to the posterior adductor muscle. At this point the edges become free, though the lobes are united below; the edges at first lie close together, but gradually become more separated, continuing thus to the posterior part of the shell, where they are entirely free.

The ridge on the dorsal portion of the united mantle is caused by the insertion of the mantle between the rudimentary teeth. Behind the body of the animal the outer lamellæ of the gills are attached to the mantle lobes, the inner lamellæ to the outer lamellæ of the inner gills, the inner lamellæ of the inner gills are attached to each other, thus forming a connection between the lobes, and dividing the space between them into two parts or cavities. The inferior and largest cavity is known as the branchial or pallial chamber; the superior is known as the anal or cloacal chamber. At the posterior portion of the branchial and cloacal chambers are situated, respectively, the rudimentary ventral or inhalent siphon (Pl. 5, i. s.) and the dorsal or exhalent siphon (Pl. 5, e. s.) formed by the thickened portion of the mantle, just within the edge, which is capable of considerable expansion and contraction. When the animal is undisturbed the shell is generally slightly opened, the siphons expanded and projecting beyond the edges of the valves (Pl. 3, i. s.). The portion of the mantle representing the inhalent siphon has numerous tentacles (Pl. 3, i. s.; 4, fig. 9), which are developed from the inner portion of the mantle. On the exhalent siphon they exist only in a rudimental state, though in some species of Unio the tentacles on the exhalent siphon are of nearly or quite the same strength as the tentacles of the inhalent siphon. The tentacles of the inhalent siphon, in a moderate sized specimen of this species, are about two mm. in length and .35 mm. in diameter, consisting generally of a hollow tube, largest at the base and gradually diminishing in size to the end; occasionally they are forked at the end. They are covered with cilia or microscopical filaments, which keep up a rhythmical motion, causing currents of water to constantly enter the branchial chamber. The two lobes of the mantle are not joined below the inhalent siphon. The lower portion of the exhalent siphon is formed by the uniting of the gills; the upper portion by the uniting of the two lobes of the mantle.

On the dorsal part of the animal is an essentially oval space, which is the pericardial cavity. The portion of the mantle over this space is extremely thin and quite transparent. The rest of the mantle to the pallial line is thicker, but still semi-transparent; from the pallial line to the free edge, the mantle is considerably thickened; at the edge it is very much thickened, and is divided into two portions or lips, between which is a smaller ridge. The epidermis is deposited by that portion of the mantle consisting of this ridge, a fringe of the epidermatic layer being usually found adhering to it. The prismatic layers are deposited by that portion of the mantle nearest the edge: the nacreous layers by the other portion of the mantle. Numerous blood vessels extend through the mantle, frequently branching and anastomosing (Pl. 5, v. e.). Below the pallial line, in the thickened portion of the mantle, are numerous radiating muscular fibers, more plainly apparent on the posterior portion (Pl. 5, m. f.).

The mantle is also supplied with nerves proceeding from the cerebral and posterior ganglia (Pl. 5, a. m. n., p. m. n.) which will be spoken of more fully under the head of the nervous system.

The mantle is composed of two layers, the inner one consisting of ciliated epithelium cells, and the outer and shell-producing layer consisting of non-ciliated cylindrical cells.

THE CILIA.

(Plate 7, fig. 1.)

The cilia are extremely minute and delicate hair-like processes, varying in length from $\frac{1}{12000}$ to $\frac{1}{1000}$ of an inch. The name is derived from the Latin word *cilium*, an eyelash. The cilia, during life, and sometime after death, keep up a constant, rapid, regular motion. Water or any fine substance coming in contact with them is rapidly propelled in the direction of the movement of the cilia.

Cilia occur not only in mollusca, but also in mammals, birds, reptiles, actinia, echinoderms, etc. The motion of the cilia does not cease with the death of the animal, but if the parts are kept moist the motion will continue for some time afterward. In examining the gills of an Anodonta, about thirty hours after they had been removed from the animal, in the meanwhile remaining in water, the movement of the cilia was apparent, as regular and rapid as during the life of the animal; how much longer the movement may have continued I do not know.

The cause of the rapid, rhythmical motion of the cilia has not been satisfactorily explained. This movement continues after the apparent death of the animal. The integrity of the cells to which they are attached is necessary to the movement, for as soon as these shrink from want of moisture, or are destroyed from any cause, the movement of the cilia ceases.

The cilia occur on the inner side of the mantle, on the labial palpi, the foot, tentacles of the siphon, the margins of the plates of the outer side of the gills, in the mouth, stomach and alimentary canal, and on the tentacles of the siphon. If a few grains of any colored matter, for instance, carmine, is placed in the water near the posterior portion of an Anodonta, as it lies in the water in its natural position with the shell slightly expanded, it will be observed to enter the branchial cavity, and in a short time afterward to pass out at the exhalent siphon. The cause of this is the action of the cilia. The movement of the cilia on the interior of the mantle is toward the anterior end, and the water entering the branchial siphon is consequently forced in that direction. The movement of the cilia on the margins of the plates of the gills is from the ventral to the dorsal portion, and by them a portion of the water being forced toward the anterior end, is diverted from its course and passes over the gills from their ventral to their dorsal margins, aërating the blood in the capillaries. From the dorsal portion of the gills to the posterior portion, the movement of the cilia is toward the posterior end; in this manner the water which has passed over the gills is forced out through the dorsal siphon.

The portion passing to the anterior part of the animal is conveyed, by the action of the cilia of the palpi to the mouth, by the cilia of the mouth and œsophagus into the stomach, and from the stomach through the intestinal canal, passing out of the anus; the nutritive portion having been digested and assimilated.

MOUTH, STOMACH, ALIMENTARY CANAL.

(Plates 6, 10, 11, 13.)

The mouth or oral aperture consists of a broadly oval, nearly circular, horizontal aperture (Pl. 6, m., Pl. 13, figs. 4, 5, m.), situated in the anterior portion of the body, just beneath the adductor muscle. The mouth is simply an opening or cavity, without any trace of a masticatory apparatus. The lining of the mouth consists of ciliated epithelium cells, continuous with the labial palpi, or, as they are designated by some authors, the oral tentacles. The mouth connects with the stomach by a very short œsophagus, the lining of which also consists of ciliated epithelium, the food being conveyed to the stomach by the action of the cilia.

The stomach (Pl. 6, s.), which is situated just back of the anterior adductor muscle, is irregular in shape, the general form being round or oval, with several depressions and plications which are stronger on the inner surface. The stomach is invested by the liver (Pl. 6, l.), with which organ it is connected by the minute orifices in the cæcal tubes of the liver. On the right side, the stomach communicates with a blind sac, the nature and use of which body is not definitely known. It varies in size at different times of the year, being found most prominent after winter. Various explanations and conjectures have been made regarding the use of this organ, but nothing is known with certainty. The general direction of the œsophagus and stomach is toward the dorsal margin.

The intestine proceeds from the left side of the stomach ; as soon as it leaves the stomach it turns downward at an angle of a little more than 45 degrees to the hinge-line (Pl. 6, fig. 1, i. c.).

The measurements given below are from a specimen, the body and foot of which combined are five centimetres in length and three in width ; of course in larger and smaller specimens, the individual measurements would be different, but the comparative measurements would be the same.

The intestine proceeds from the stomach downward and backward with a slight curvature till within a short distance of the posterior margin of the body, a little above the foot ; it then turns toward the dorsal side for a short distance, corresponding in curvature to the margin of the body. At about midway between the dorsal and ventral margins of the body (that is, the body proper and the foot), the curvature is toward the anterior and so continues to a point five millimetres below the renal organ, and a little less than two centimetres posteriorly to the stomach — for this distance the intestine is small, being about one millimetre in diameter. At this point the dorsal part of the intestine is slightly prolonged and firmly attached to the surrounding mass (Pl. 6, fig. 1, i. è.). The intestine here turns abruptly toward the right side and continues in that direction for the distance of three millimetres, then turning backward and continuing just posterior to and nearly parallel with that portion previously described to a point about two-fifths the length of the body from the mouth, where the ventral portion is slightly prolonged and attached to the surrounding mass (Pl. 6, fig. 1, i. ĉ.). The intestine thence turns abruptly toward the right side of the body. The portion of the intestine last described is somewhat larger than that first described, being about two millimetres in diameter, and at the point where it turns toward the right side it becomes somewhat clavate in shape, and is three millimetres in diameter: after turning to the right side it almost immediately turns toward the dorsal and posterior part of the body, crossing the portion first described nearer to the right side, continuing in this direction for the space of twenty millimetres, then curving toward the anterior. At this part the intestine is small, being about one millimetre in diameter. Almost immediately beyond the point where the direction of the curvature is toward the anterior, the intestine turns toward the left side and abruptly enlarges to a diameter of about five millimetres and continues nearly to the dorsal margin, parallel to and nine millimetres from that portion of the intestine proceeding from the stomach toward the post-ventral margin of the body. The intestine gradually becomes smaller as it approaches the dorsal surface, at that point being a little more than three millimetres in diameter; it here turns abruptly backward, leaving the body and passing through the ventricle, though entirely unconnected with that organ, thence over the posterior adductor muscle, and ending just beyond that muscle, opening into the cloacal chamber.

The intestine after leaving the body is called the rectum (Pl. 6, r.), the opening at the extremity is the anus (Pl. 6, a.).

The lining membrane of the intestine, throughout its entire length, has numerous strong transverse folds. On that portion of the intestine nearest to the ventral margin, a ridge commences which continues to the extremity.

Digestion takes place in the stomach, and the nutritive matter evolved transudes through the walls of the intestine and thus enters the system.

THE LABIAL PALPI.

(Plate 13.)

The labial palpi consist of two pairs of thin contractile, foliated lobes, two on each side of the body (Pl. 13, fig 5, l. p.). They are subtriangular in outline. The widest portion situated posteriorly. The following measurements are of the palpi of an animal eight centimetres in length: length, 17 mm., width at posterior portion, 8 mm., rapidly narrowing to the oral cavity (Pl. 11, fig. 3). The outer lamina passes above the mouth, the inner below, each becoming continuous with its fellow on the opposite side, and continuous with the lining membrane of the mouth and forming lips to that organ (Pl. 13, fig. 5). The dorsal margins of the outer palpi are attached to the inner face of the mantle, that of the inner laminæ to the foot. The outer and inner palpi of each side of the animal are united along a line designated by dots on fig. 6, Pl. 13. The outer faces of the laminæ are smooth and consist of a thin layer of epithelium; the inner faces, for two-thirds the length from the posterior portion, are strongly ridged transversely; the free edges of the palpi being crenulate. There are about eighteen ridges in the space of five millimetres. The summits of the ridges have comparatively large vibratile cilia (Pl. 13, fig. 7). At a point two-thirds of the length of the palpi distant from the posterior ends the transverse ridges abruptly terminate, and from that point to the mouth the ridges are irregular and longitudinal, also ciliated. When the animal is living the inner face of the outer palpi and the outer face of the inner palpi are slightly distant from each other. The current of water which contains the minute animal and vegetable substances constituting the food of the Anodonta, is by the cilia of the transverse ridges of the palpi carried toward the mouth, and by the action of the cilia of the longitudinal ridges directly to the mouth, and then by the cilia of the lining membrane of the oral cavity and short œsophagus, to the stomach.

THE LIVER.

(Plates 4, 6.)

The liver invests the stomach (Pl. 6, fig. 1, l.), and consists of a greenish brown sponge-like mass, formed of cæca or tubes arranged in racemose clusters, and communicating with the stomach by means of minute orifices; the cæca or tubes (Pl. 4, figs. 7, 11) are lined with epithelium cells.

The liver is abundantly supplied with blood and from the blood the cæcal tubes extract a fluid which resembles the bile of animals of higher organization, which fluid enters the stomach by means of the orifices previously mentioned, and aids in the process of digestion.

THE RENAL ORGAN.

(Plate 9.)

The renal organ, or organ of Bojanus is situated immediately below the pericardium. It is thus called after the name of its discoverer, Bojanus. This name has not been universally adopted and I shall use the term renal organ as being more appropriate.

The renal organ consists of two symmetrical lateral parts. Each part is separated into two chambers, the upper and the lower. The upper is the smaller and known as the non-glandular or pleural sac (Pl. 9, fig. 4, n. g. s.), the roof of which is formed by the floor of the pericardium. It is filled with water and is separated from the glandular portion by a thin transparent wall. The glandular sac is situated immediately below the non-glandular sac, and is filled with dark brown, nearly black granular matter (Pl. 9, fig. 4, g. s.). The non-glandular sac extends only to the posterior portion of the pericardium. The glandular sac extends below and in front of the posterior adductor muscle, and invests the tendons of the posterior retractor muscles. In the floor of the pericardium immediately below the place where the intestinal canal enters the body, are two small oval openings, with tumid lips (Pl. 9, figs. 4, 5, 7 o. p. g.). These openings communicate with passages through the glandular sac. (Pl. 9, figs. 4–7, o. p. g.) Near the posterior portion of the glandular sac these passages enter the non-glandular sac. (Pl. 9, figs. 4, 6, 7, o. e. s.) In the anterior portion of the non-glandular sac is a small opening which communicates with the epibranchial chamber, just back of the attachment of the inner gill to the body. (Pl. 9, figs. 4–7, o. b. c.) It will thus be seen that the pericardium indirectly communicates with the exterior. This arrangement will be more distinctly understood by referring to Pl. 9, fig. 7, where the passage is represented as a tube.

The walls of the vena cava are traversed by numerous small blood-vessels which pass from the vena cava to the gills.

The renal organ is, in all probability, analogous to the kidney of vertebrate animals. Its functions will be again spoken of under the head of circulation of the blood.

PERICARDIUM, HEART.

(Plate 9.)

From a point on the dorsal portion of the body just posterior to the umbo, to the posterior adductor muscles, is an oval cavity about twice as long as wide, inclosed above by the thin semi-transparent part of the mantle, and filled with a colorless fluid. This cavity is the pericardium (Pl. 9, figs. 1, 2, 3, p.), and differs in some important respects from the analogous organ in man and other vertebrate animals in which it consists simply of a sac filled with a fluid, facilitating the movements of the heart, while in the Anodonta and mollusca generally it contains blood as well as other fluid matter, and connects indirectly with the exterior. The movements of the heart may be observed through the thin mantle — when the mantle is removed the heart is laid bare. It consists of one median and two lateral chambers, respectively named the ventricle and auricles. (Pl. 9, figs. 1, 2, 4, v. au.) The ventricle is a sac of yellowish color, oval in form, contracting and expanding, not regularly and every portion at once, bu in a peristaltic manner. In contracting and expanding the ventricl assumes different shapes, from nearly circular to elongate-oval. Continuing through the middle of the ventricle can be seen a portion o the rectum; at the anterior portion where the rectum enters, the ventricle is narrow, scarcely more than the diameter of the rectum. From the ventricle proceed two comparatively large tubes (Pl. 10, fig. 1, a. ao., p. ao.) the anterior and posterior aortæ. The anterior aorta (Pl. 10, fig. 1, a. ao.), leaves the ventricle immediately above the intestine, and enters the body in close contiguity to that organ. The posterior aorta passes below the rectum. The walls of the ventricle consist o two thin layers of epithelium, between which is a layer of muscular fibre, in which are delicate nerves proceeding from the posterior ganglia.

The auricles consist of nearly transparent sacs, pyramidal in form, connecting at their apex with the ventricle. The bases are attached to the walls of the pericardial cavity, and are about equal in length to the ventricle.

The pyramidal shape of the auricle is seen only when the ventricle is pushed to one side. Naturally the auricles lie close to the side of the ventricle, and when that organ is expanded are almost entirely concealed. The auricles contract, forcing the blood into the ventricle, when the ventricle contracts, the valve (Pl. 9, fig. 3) connecting the auricles and ventricle closes, and the blood is forced through the aortæ.

THE GILLS.

(Plates 7, 10.)

The gills are four in number, one outer and one inner gill on each side of the body. Each gill consists of two laminæ, united along their ventral edge, separated along their dorsal edge. The dorsal edge is essentially straight, the anterior, ventral, and posterior edges follow the curvature of the margin of the shell. The length of the gill is a little more than two-thirds the length of the shell; the width bears about the same proportion to the height of the shell, the length of the gill being a little less than three times the width. The outer gills are slightly larger and capable of greater extension than the inner gills. The anterior portion of the gills is situated at a distance, equal to one-fourth the length of the shell, from the anterior margin.

Their manner of attachment is as follows. The outer laminæ of the outer gills are attached to the interior of the mantle a short distance from the dorsal portion, just below the pericardial space. They continue attached until within a short distance of the posterior extremity.

The inner lamina of the outer gill and the outer lamina of the inner gill are attached. The inner lamina of the inner gill are at the anterior portion attached to the foot, but soon become free and remain so for about one-half their length; back of the adductor muscle they are united, and the dorsal part of the gills form a partial floor across the space between the two lobes of the mantle, separating that space into the branchial and epibranchial chambers. The two laminæ of each gill are united by their plates. There are about sixteen of these plates in the space of five millimetres.

It is in the spaces or pockets formed by these plates and the laminæ of the gills, in the outer gills, that the young of the Anodonta remain after being expelled from the ovaries, until they arrive at a certain stage of development. The outer gills when filled with young are very much distended, the thickness being several millimetres. The form of the young shells can be distinguished only by the aid of a lens, and in their form they differ so much from the parent, that to a person who had not read a description of or critically studied them, their true character would not be apparent.

The outer face of each lamina is composed of flat plates (Pl. 7, fig. 1, g. p.) supported or rendered firm by chitinous rods (Pl. 7, fig. 1, ch.), cylindrical in shape, two rods in each plate. Apparently these rods are short, regularly arranged in pairs, with a short space between each pair without rods, but on close examination, they will be seen to be continuous though at regular distances very slender. The edges of these plates have large cilia (Pl. 7, fig. 1, ci.), which keep up a constant motion. These plates support on one side a mesh-work of capillaries (Pl. 7, fig. 2), arranged in bands, the space between each band equal to the width of the band. The gills possess nerves which will be described under the head of the nervous system.

MUSCULAR SYSTEM.

(Plate 8.)

The principal muscles are the anterior and posterior adductors, the anterior and posterior retractors, and the protractor pedis; in addition to these there are two small muscles near the umbo, and small muscles along the pallial line.

The anterior and posterior muscles are cylindrical bundles of fibres, which pass transversely from one valve to the other, and serve to keep the valves closed, antagonizing the action of the ligament. Whenever from the will of the animal or from any cause the muscles of the animal are relaxed, the valves open by the action of the ligament.

The anterior adductor (Pl. 8, a. a.), is situated near the anterior margin, the base a little above a median line; it is oval in shape, about one-third longer than wide.

The posterior adductor (Pl. 8, p. a.) muscle is situated on a line with the anterior, a little more distant from the posterior margin than the anterior muscle is from the anterior margin; it is one and two-thirds larger than the anterior muscle, about one-third longer than wide. The protractor pedis muscle is situated just posterior to the base of the anterior adductor muscle (Pl. 8, p. p.); it is fan-shaped in appearance, spreading over a large portion of the body and foot (Pl. 8, fig. 2, p. p.), very near the surface. If the body is scraped gently with a knife the strong muscular fibres will be immediately seen. This muscle acts in opposition to the anterior and posterior retractor.

The anterior retractor muscle (Pl. 8, fig. 1, a. r.) has its origin just posteriorly to the upper part of the anterior adductor muscle. The impression made by the attachment of the muscle to the shell being about one-third the size of that of the anterior adductor. The greater portion of the fibres of this muscle pass downward toward the ventral and anterior margin of the foot, having their greatest development in the anterior portion, but some of the fibres pass upward, over and through the substance of the liver. The fibres are for the most part more deeply imbedded than either the protractor pedis or posterior retractor fibres.

The posterior retractor muscles have their origin just anterior to the upper portion of the posterior adductor (Pl. 8, fig. 3, p. r.). The impression made by the attachment of this muscle to the shell is about one-eighth the size of that of the posterior adductor muscle. It is at first a muscular stem, but soon spreads, continuing through the lower portion of the body and the foot, finding its greatest development in the foot. Some of the fibres pass among those of the protractor pedis, but as a rule they are beneath them.

At a short distance from the ventral margin the mantle is attached to the shell by numerous small muscles along a line essentially parallel with the margin of the shell; the impression of these muscles forming the pallial line. Their fibres extend to the ventral margin of the mantle, composing a large portion of that part of the mantle.

If a portion of the muscle is examined under the microscope it will be seen that the fibres are composed of spindle-shaped bands (Pl. 4, fig. 9), each of which contains an elongated nucleus. The space around the nucleus is clear, but the rest of the band contains a great number of granules, arranged in somewhat indistinct transverse rows.

THE NERVOUS SYSTEM.

(Plates 9, 12, 13.)

The nervous system consists of nerve centers or ganglia, connected by nerves designated commissural cords or commissures, and nerves proceeding from the nerve centers to different portions of the body, and known as peripheral nerves.

The nerve ganglia are designated as the anterior or cerebral, the pedal, and the posterior or parieto-splanchnic — a compound word derived from the Latin *parietes*, a wall, and σπλάγχνον, the intestine — and are so named because nerves of the mantle in part, the gills and of the viscera, were supposed to proceed from this ganglion; but the pedal ganglia furnish the nerves of the viscera, and the cerebral ganglia furnish nerves to a large portion of the mantle. The name being both unwieldy and calculated to mislead, I shall use the term posterior both as being simpler and precisely defining the position of the ganglion.

On Plate 9 is a figure showing the nerves in position, on Plate 13 the nerve centers enlarged, and on Plate 12 the nerves dissected out and enlarged twice. The same letters apply to each of the plates. The different nerves will, however, be more clearly distinguished on Plate 12.

The anterior or cerebral ganglia (Pl. 9, 12, 13, c. g.) are two in number, and are situated one on each side of the animal, just back of the lower portion of the anterior adductor muscle and between that muscle and the protractor pedis, very near the surface, so that when the shell is opened by cutting the muscles close to the shell, the ganglia are generally exposed. They are wider than thick. The anterior portion being the widest, gradually narrowing to the posterior portion, which is about two-thirds the width of the anterior; the length is a little more than the width of the anterior portion. The measurements in one specimen are as follows: width of anterior portion, one millimetre; posterior portion, two-thirds of one millimetre; length, one and one-half millimetres; thickness, a little less than two-thirds of one millimetre. On account of the two nerves proceeding from the upper portion, and the two from the lower portion, the ganglion presents an indistinct bilobate appearance.

From the upper angle of the anterior portion (Pl. 9, 12; 13, c. c.) a commissural cord proceeds forward and upward, encircling the œsophagus and connecting with the cerebral ganglion of the opposite side. From the lower angle of the anterior portion (Pl. 9, 12, 13, a. a. n.) a peripheral nerve passes directly forward into the anterior adductor muscle, bifurcating when about half way through the muscle, and giving forth numerous filaments: from the lower part of the posterior portion a commissural cord proceeds, continuing to the upper portion of the animal, just below the generative orifice, thence through the glandular portion of the renal organ. Through the renal organ the cords from the cerebral ganglia, that is, one from each ganglion, are parallel and nearly contiguous to each other (Pl. 12, o. b. n.) until they approach the tendons of the posterior retractor muscles, when they separate, passing over the exterior of the tendons, then rapidly approaching each other, and uniting with the posterior ganglion (Pl. 9, 12, 13, p. s. g.).

From the upper angle of the posterior portion of the cerebral ganglion a commissural cord passes dorsally and posteriorly, for a short distance, nearly parallel with the commissural cord uniting the anterior and posterior ganglia (Pl. 12, p. e. c.; Pl. 13, fig. 2, p. e. c.); then turning toward the posterior and ventral portion, it passes through the substance of the liver, below the stomach, and unites with the pedal ganglia (Pl. 9, 12, p. g.). Sometimes branching from the nerve of the anterior adductor muscle, at other times proceeding directly from the ganglion just posterior to the insertion of that nerve, there is a somewhat finer one, which continues forward into the anterior portion of the mantle (Pl. 9, 12, a. m. n.). A peripheral nerve proceeds from the under side of the ganglion, about midway between the ends, and passes almost directly downward into the mantle (Pl. 9, 12, a. m. n.) bifurcating at a short distance from the ganglion — one branch continuing nearly directly downward, the other continuing toward the posterior portion, giving off several branches to the thickened muscular border of the mantle, continuing apparent to the unaided eye, for a distance of a little less than one-half the length of the mantle.

The pedal ganglia (Pl. 9, 12, p. g.) are situated in the body, about one-fourth of its length from the anterior margin, thus being a little posterior to the cerebral ganglia, and about one centimetre distant from them, situated midway between the sides of the body; they consist of two elongate oval bodies, which are joined to each other for about one-half their length, which is a little less than three millimetres; width, one millimetre. Their natural position is at an angle of forty-five degrees to a vertical line through the body. From the upper end proceeds the commissural cord connecting the cerebral and pedal ganglia (Pl. 9. 12, p. e. c.). From the lower end proceeds a peripheral nerve (Pl. 9, 12, p. h. n.), which continues on a line with the ganglion, having frequent branches, to one of which is attached the auditory organ (Pl. 9, 12. au. s.). From just beneath this nerve another nerve proceeds, having the same general direction, but smaller. A little anterior to the first-mentioned nerve is another nerve which bifurcates at a short distance from the ganglion, and continues in the muscular strata of the foot at an angle of ten degrees to the first-mentioned nerve; from this nerve, and also from the others described, proceed numerous filaments. From a point about midway between the ends proceeds another nerve, which continues almost directly toward the ventral margin among the muscular fibres; about midway between this nerve and the commissural cord is another nerve (Pl. 9, 12, an.), which continues directly toward the anterior portion of the animal, among the muscular fibres, bifurcating at a short distance from the ganglia. From the middle of the dorsal portion (Pl. 9, 12, m. n.) a nerve proceeds, continuing posteriorly at right angles to the length of the ganglion. The nerve proceeding from the pedal ganglia furnishes nerves to the muscles of the body and foot, and to the viscera.

The posterior ganglia (Pl. 9, 12, p. s. g.) are situated immediately below the posterior adductor muscle, and are so closely apposed as to present the appearance of a single bilobate ganglion. The bilobate appearance is more apparent than that of the cerebral ganglia, but they are much more closely united than the pedal ganglia; each ganglion is two millimetres long and one and one-half millimetres wide, and the inner margin is joined to its fellow throughout the entire length. From the anterior portion proceed the commissural cords (Pl. 9, 12, p. s. c.), connecting the posterior and cerebral ganglia. From the anterior angles of the ganglia (Pl. 9, 12, g. n.) proceeds a peripheral nerve, which for a short distance continues parallel with the commissural cord, then curving away from that cord turns quite abruptly backward, continuing along the junction of the exterior lamellæ of the inner gills and the inner lamellæ of the outer gills, branches entering the gills. From the posterior portion of the ganglia a very large nerve takes its origin, the diameter of which is equal to three times the diameter of the commissural cord. (Pl. 9, 12, p. n.) This nerve at first continues directly toward the posterior portion of the animal, branching at the distance of about seven millimetres from the ganglia (Pl. 9, 12, p. m. n.). The branch entering the mantle is first directed toward the ventral portion, gradually curving and becoming parallel with the ventral portion, and having frequent branches, which continue into the muscular portion of the mantle. This nerve is slightly smaller than the commissural cord. Almost immediately after this branch leaves the large nerve, that nerve again branches, the larger portion continuing toward the rudimentary branchial siphon, and its branches supplying that portion of the mantle with nerves (Pl. 9, 12, b. n.). Likewise the smaller portion proceeds toward the rudimentary exhalent siphon. In addition to these principal nerves, there are other small nerve filaments supplying the different organs of that portion of the animal with nerves.

The auditory organ consists of a sac attached to one of the branches of the nerve proceeding from the lower end of the pedal ganglion, is filled with colorless fluid, and contains a hard body called the otolith, which is covered with cilia and keeps up a constant rotary motion.

The sense of touch appears to be very acute, more especially in the foot proper ; the slightest touch, when the foot is expanded, causing it to contract immediately.

Though possessed of an organ of hearing and without organs of sight, as far as our present knowledge extends, the Anodonta is much more sensitive to light than to sound. I have kept a large number in a tank for several months, and have thus had a good opportunity to judge of the effects of sound and light, and from the observations and experiments I have made, it seems certain that they are not affected by any sound which does not communicate a visible jar to the water.

That they are sensitive to light is shown by the fact that on bright days the rudimentary siphons are more fully expanded, and the inhalant and exhalant currents much stronger than on cloudy days or at night ; at which times the shell is generally closed.

The use of the tentacles surrounding the inhalent siphon has not been satisfactorily determined. It is possible that they will prove to be organs of sight. It seems impossible that animals so sensitive to light should be without special organs of vision.

Circulatory System.

The blood of the Anodonta is colorless. The corpuscles are similar in form and structure to colorless blood corpuscles of man, and have the same continually changing movements. Owing to the soft jelly-like nature of the animal substance, it is extremely difficult to determine with accuracy many points in relation to the circulation.

From the ventricle of the heart proceed two aortæ (from the Greek word αορτή the heart), a name applied only to the arteries which proceed directly from the heart. The anterior aorta (Pl. 10, a. ao.) enters the body above and in close contiguity to the intestinal canal, bending slightly to the right, turning downward and a little posteriorly, one branch entering the mantle : just behind the anterior adductor muscle a large branch goes downward and runs parallel with the margin of the foot, between the muscular portion of the foot and the body proper, sending numerous branches down to the ventral margin of the foot. Immediately after this branch leaves the main artery it sends out a branch to the anterior adductor muscle, mouth, and other anterior portions of the body; the main artery continues posteriorly, dividing into three large branches, continuing over and between the folds of the intestine. The posterior aorta (Pl. 10, p. ao.), leaves the ventricle below the rectum, and just before reaching the posterior adductor muscle it bifurcates, and sends branches to the posterior adductor muscle, to the pericardium, and to the rectum. The larger branch passes over the posterior adductor muscle entering the mantle, and continues in the thickened portion of the mantle below the pallial line until it meets the branch from the anterior aorta. The blood is returned in the body by innumerable small veins, gradually growing larger toward the vena-cava. For a short distance before leaving the body there is a large sinus which is formed by the union of the larger veins, these connecting with the innumerable small veins; this sinus connects with a cavity situated beneath and between the two portions of the renal organ, which is known as the vena-cava, which connects with veins and capillaries of the gills. By the contraction of the ventricle the blood is forced through the anterior and posterior aortæ to the extremities, and is returned by the veins to the vena-cava; it then passes through the tissues of the glandular sac of the renal organ; it there loses its urea; the renal organ performing the same office as the kidneys of vertebrated animals, thence passing through the gills, and in the gills through a fine net-work of capillaries, and by contact with the air in the water becoming oxygenated, the gills performing the same functions as the lungs of vertebrated animals. The blood circulating through the thin portion of the mantle also becomes oxygenated to a certain extent, the action of the capillaries of the gills being supplemented by those of the mantle; from the capillaries of the gills the blood returns to the auricles and from them to the ventricle. The body sinus connects with the vena-cava by an oval opening, which is covered by a projection from the anterior side, which is held in place by a muscular cord; this arrangement of the valve permits the flow of blood from the sinus to the vena-cava, but effectually prevents any return. The auricles are connected with the ventricle by an oval opening; the "lips" of this orifice are very thin and extend into the ventricles (Pl. 8, fig. 4), they are in shape like a sack, with both ends open. At the orifice they are kept apart by their attachment to the margins of the orifice, but as they recede the two margins fall together. When the auricle contracts, the blood easily passes through this valve, but when the ventricle contracts, the margins fall together, preventing the return of the blood to the auricles and causing it to be forced through the aortæ.

The pericardium has direct communication, both with the blood system and also with the branchial chamber, and thus contains a mixture of blood and water.

The non-glandular sac of the renal organ connects with the branchial chamber, is filled with water and carries off the waste product separated from the blood by the action of the glandular sac.

SEX AND REPRODUCTION.

Formerly the Anodonta was considered to be androgynous or unisexual, that is, the male and female organs combined in one animal. Leeuwenhoek, in 1702, maintained that they were bisexual, though afterward changing his opinion. The former view is now accepted by nearly all writers on the subject, though it is still maintained by some that they are unisexual. The fact that the organs of generation in all individuals are very similar, and as far as my observation goes, during the breeding season fully nine-tenths of the animals have their gills distended with young, gives some plausibility to that belief, for if the animals are bisexual, we would naturally expect to find the sexes in about equal proportions. It is claimed also that from the greater room required by the female in the shell, owing to the distension of the gills with the young, that the shells of that sex are more gibbous than those of the male, but so far as *Anodonta fluviatilis* is concerned, that belief is an error, though undoubtedly true in regard to some species of Unio. Among the few Anodonta found by me, the gills of which did not contain young, were some, the gibbosity of which was so great that the thickness was nearly equal to the height, while among those, the gills of which did contain young, were some quite flat, the thickness scarcely exceeding one-fourth the height. That some of the animals were without young does not weaken the force of the argument of those believing in unisexuality, for even if the animals were hermaphroditic, from various causes there would, in all probability, be some without young. It seems to me that the simplest way to settle the matter would be, not microscopic investigations, but to collect large numbers at the time when the gills of the females are distended with young, if half or even one-third were without young it would nearly prove the bisexual view to be right; on the other hand, if nearly all were with young, the opposite would be proved. For certainly in order to fertilize the individuals in a pond or river, the males should be in considerable numbers. The generative organs, testes and ovaries consist of racemose glands, situated on each side of the subhepatic region of the body, the external openings of which are near the attachment of the inner gill to the body by the side of the openings of the pleural sac of the renal organ. The egg is globular and transparent. The spermatozoa are short rod-like bodies, with an active cilium. The yolk of the egg is prolonged into a short tube with open end, through which (according to Barry) the spermatozoa enter. The ova pass out of the generative opening during the latter part of summer, passing into the cavity formed by the two lamellæ of the outer gills, and there remain until the following spring, when they are sufficiently developed to leave the protection of the parent.

The yolk divides into two portions, nearly, but not quite, separating. The valves are connected by a hinge; near the hinge line is an adductor muscle, which by its frequent contractions gives a flapping motion to the valves; in the angle formed by the junction of the two valves is a short hollow tube, from which is produced a long filament known as a byssus; the valves are slightly convex-trigonal in outline, presenting very much the appearance of a shield (Pl. 4, fig. 2), in no respect resembling the adult shell. The apex is prolonged into a serrated spine at right angles to the shell, the teeth or serrations are on the upper portion of the spine and are in two rows. After the valves have become definitely closed by the action of the adductor muscle, the halves are blended together, the gills are developed, the foot grows, the form of the shell changes, and the young Anodonta becomes like the parent in every respect except size.

THE ABORIGINAL WORK ON BLUFF POINT, YATES COUNTY, N. Y.

By S. HART WRIGHT, Penn Yan, N. Y.

The accompanying diagram (plate 14) represents an ancient work in the town of Jerusalem, Yates county, N. Y., and is on Bluff Point in lots numbers 5 and 6, on the farm of Mr. Harris Cole.

Bluff Point is a high and rather sterile region lying between the two arms of Keuka lake, its ridge being about 800 feet above the lake.

This aboriginal work occupies about seven acres of land, extending from the highway on the top of the ridge westward, or toward the west arm of the lake, having a slight descent westward. The sedimentary shales and flags of the Portage group are only one or two feet below the surface.

The curious structure consists of (what I may call for the want of a better term) *graded ways* of from three to eight feet wide, and now about one foot high, with a vast number of large flat stones set in the ground edgewise on each side of the ways, the stones leaning toward the middle of the ways. The indications are that these graded ways have never been over two feet high. All the areas between these ways are depressions, in which water remains until evaporated, the nearness of the rock below, often being only twelve or fourteen inches, preventing its absorption. These areas, or many of them, contain bogs of carex, and some grass, but in the summer are dry and afford a fair pasturage. The dirt used to make the ways was taken from these areas causing the depressions, and the rock beneath was no doubt at that time completely laid bare and furnished the flat stones that are set in on each side of the graded ways.

All of that portion of the work in lot number 6 has never been ploughed and the ways are easily traced when the grass has been removed. Those lying in lot number 5 have been destroyed, but are traced from the quantity of small fragments of stones still on the surface.

I have not been able to find any relics in this work, which is one of the strangest structures in the State. I find nothing similar to it, figured in any work on archæology.

No trees are in the structure except a few young ones. There is no living spring of water nearer than a mile at the south-west.

The purpose for which this structure was made, and the race who built it, are matters of conjecture. Had interments been made in the ways, the fact would have been fully disclosed by the destruction of all that portion in lot number 5. But none of the oldest inhabitants of the region have ever seen any relics of bones there. The soil has not depth enough anywhere in the seven acres (being seldom more than eighteen inches deep) to allow of human interments.

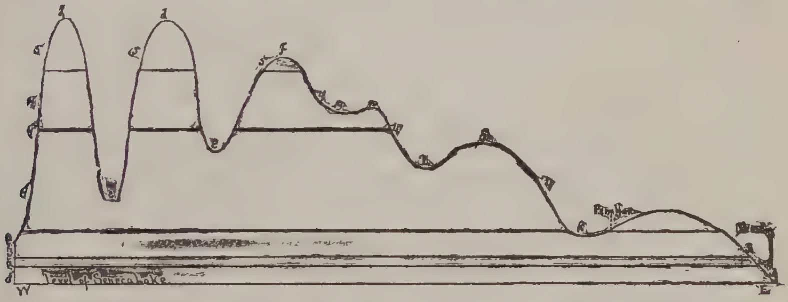
Its rectilineal divisions, some of which are over five hundred feet long, are made with almost mathematical accuracy, and indicate a skill we can hardly attribute to the red man. This work may belong to the age of the mound-builders and be one of the many curious structures of that people.

NOTES ON THE GEOLOGY OF YATES COUNTY, N. Y.

By Berlin H. Wright, Penn Yan, N. Y.

Surface.

The surface of Yates county is divided by five great ridges extending in a northwardly direction. These ridges gradually decline, from a height of 600 to 1,800 feet above Seneca lake, to a gently undulating region in the towns of Torrey, Benton, Potter and Middlesex. The first ridge is between West River hollow and Canandaigua lake, and ends in an abrupt promontory about 1,000 feet above the valley beneath it, and about 1,780 feet above the level of Seneca lake.



Explanation:—*Section across Yates county, N. Y., from the head of Canandaigua lake to Dresden, on the west shore of Seneca lake.*

Horizontal scale = 4⅔ miles to 1 inch.
Vertical scale = 1,066 feet to 1 inch.
1. Moscow shale, 100 ft.
2. Tully limestone, 12 ft.
3. Genesee slate, 150 ft.
4. Portage group, 1,000 ft.
4′. Stratum of gypsiferous limestone, 1½′ thick.
5. Chemung group.
a. Level of Canandaigua lake.
b. West ridge.
c. West River hollow.
d. Italy hill.
e. Flint creek, Italy hollow.
f. Italy hill.
g. Sherman's hollow.
h. West hill.
i. Larzaliers' hollow. Valley of ancient outlet of Lake Keuka.
j. East hill.
k. Valley of E. branch of Lake Keuka, 331 ft. Former outlet of Lake Keuka.

The next ridge eastward lies between West River hollow and Flint creek or Italy hollow, ending near Potter Centre, and in the southern portion of the town of Italy presenting almost perpendicular sides and rising quite as high as the one west of it. The next is called Italy hill, and at its highest point, which is very near the middle of the eastern boundary of the town, rises nearly as high as those west of it.

West hill ridge is the next in order, and joins with Italy hill in the southern portions of Jerusalem and Italy, forming a large area of high land. Crossing Larzalier's hollow, through which the waters of Lake Keuka once flowed into Kashong creek, we ascend East hill. This elevation is short, terminating at the north in level lands near the northern boundary of the town of Jerusalem, and in Bluff Point at the south. There is a cutting through this ridge at Branchport to Kinney's Corners which divided Bluff Point from the main land and made an island of it when the level of the lake was seventy-five feet higher than at present. From East hill we descend into the valley of another former outlet of Lake Keuka, but more recent than the one through Larzalier's hollow. Between this hollow and Seneca lake is an elevation which terminates in high lands in the town of Barrington.

ROCK FORMATIONS.

Chemung Group.

The three western ridges are capped with the coarse sandstones and shales of the lower part of the Chemung group. There are no good outcroppings of this rock in the county, but from surface indications it would appear that some of the strata are highly fossiliferous. The coarse white sandstones have yielded us some fine specimens of *Dictyophyton tuberosum*, Conrad, *D. nodosum*, Hall, and *Lepidodendron corrugatum*, Dawson. Associated with these was *Equisetides Wrightiana*, Dawson, the description and figures of which are copied from the Quarterly Journal of the Geological Society of London for May, 1881.

EQUISETIDES WRIGHTIANA.*

PLATE XV — Figs. 1–3.

"This is a specimen from Mr. Wright's collection. It is a cast in sandstone, six centimetres in diameter, with nodes from four to five centimetres apart. The surface has a slight carbonaceous coating and is finely tuberculated, the tubercles being very regularly arranged, and representing the bases of very short hairs or bristles, which are seen entering the surrounding matrix. Impressions above the joints appear to indicate sheaths, each of about twelve broad leaves, which are abruptly narrowed and acuminate at the top, and show an indication of a median nerve or rib (fig. 10). The leaves of the sheaths are one centimetre broad and one and seven-tenths centimetres long. It would be possible, however, to interpret these supposed sheaths as due to mere plications or foldings of the epidermis; and in this case the plant may have borne verticils of leaves, of which these supposed sheaths may be merely the remains. The first explanation, however, appears more probable; and, if it is correct, the plant is a true *Equisetides*, and the present specimen is the first occurrence of this genus in beds older than the carboniferous. It is to be observed, however, that Unger has described from the *Cypridina*-slates of Thuringia plants of the genera *Kalymma* and *Asterophyllites* (*A. coronata*) with sheaths at the nodes; and my *A. scutigera*, from St. John's, has verticils of scales at the joints, which may represent sheaths. The present species has a remarkable resemblance in its markings and the form of its sheaths to a greatly magnified stem of the modern *Equisetum fluviatile*, except that the leaves of the sheaths are shorter."

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*See note at the end of explanations of figures on Plate XV.

"The species is named in honor of its discoverer. Its essential characters will be as follows:"

"Stem stout, cylindrical or broadly ribbed: surface marked with short hairs or tubercles regularly arranged. Sheaths at the joints, of about twelve leaves, of the general form of those of *Equisetumfluviatile*."

"The specimen is from the Chemung group (Upper Erian) of Italy, New York."

Somewhat higher up we found *Cyclostigma affine*, Dawson, the description and figure of which quoted from the same source as above-named, we herewith give below:

CYCLOSTIGMA AFFINE.

PLATE XV — Figs. 4, 5.

"Stem marked with alternate circular leaf-bases or areoles, slightly prominent below, evanescent above, and each with a circular dot or vascular mark. Scars scarcely two millimetres in diameter, and separated by finely corrugated bark, about twice their diameter apart. These markings occur on a stem about an inch in diameter. The *Knorria*, or decorticated form of this plant, presents irregular waving ridges, produced by the longitudinal confluence of the oblique vascular bundles."

"This plant is the nearest approach to the well-known *C. kiltorkense* of Ireland, hitherto found in America. It differs chiefly in the more closely placed areoles. It was collected by Mr. Wright, and is from the Chemung (Upper Erian) of Italy, New York. The study of this plant has led me to the belief that *Stigmaria exigua* of my report of 1871 may, when better known, prove to be a new species, allied to the present, and a member of the genus *Cyclostigma*."

In some of the coarse shales the little *Ambocœlia umbonata*, var. *gregaria*, Hall, occurs to the entire exclusion of every thing else. *Discina Alleghania*, Hall, *Orthis carinata*, Hall, *O. tioga*, Hall, occur sparingly, while large slabs are readily obtained that are filled with *Atrypa hystrix*, Hall, without spines, and associated with *Strophodonta Cayuta*, Hall.

Contrary to statements heretofore made, the Chemung group does not appear in either Starkey or Barrington. The coarse, easily-broken sandstones of the lower Chemung are readily distinguished from the fine-grained and tougher Portage rock, even in the absence of fossil remains; and in Italy hollow where the junction of the two formations may be seen, the difference is very perceptible.

Portage Group.

The greater part of Yates county is occupied by the Portage group. The lower portion of the group contains much iron pyrites and is divided into thick, solid strata of sandstone separated by shaly-beds. The sandstone is quarried in many places and forms a valuable building material.

We give herewith a cut showing evidence of disturbance as seen in the "Big gully."

Section in "Big Gully."

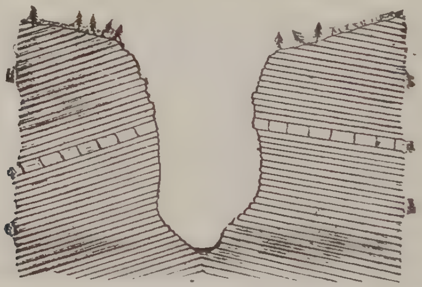

FIG. 6.—*a*. Stratum of gypsiferous rock, 1½′ thick. *b*. Portage group.

In the southern part of Milo, on the farm of Mr. Valentine, there is a large area of naked rock, or covered in places with a few inches of soil. Here is a fine exhibition of glacial action in the polished and grooved surface. Some of the striæ are of considerable depth and all parallel. Deposits of tufa and travertine are found in moist ravines in this group. Concretions of various sizes and shapes are common and often mistaken for petrifactions. Small cubical crystals of iron pyrites ("fool's gold") are not uncommon in some places.

Fine water-falls occur in several places. In Eggleston's gully, in Barrington, there is one of one hundred feet, in one unbroken descent. Some very good examples of ripple-marks or mud-waves may here be seen. In Bruce's gully, in Milo, are two falls of sixty and forty feet each. Here, in Bruce's gully, about forty feet from the base of the Portage, Dr. S. Hart Wright found a fossil, which Dr. J. S. Newberry pronounces the only Devonian representative of Agassiz's genus Pristocanthus he knows of.

The fossil remains are not plentiful, and can best be obtained in quarries and cuttings. At Whitaker's quarry, in Milo, we have obtained fine specimens of *Orthoceras Atreus*, Hall, and *O. Thyestes*, Hall. Within the chamber of habitation of a large specimen of the latter, which we collected at this locality, we found two perfect specimens of Orthoceras, each about three inches long, and with chamber of habitation one inch in diameter. The shell was broken off of one side in getting out the specimen, thus exposing the interior.

At a quarry in the town of Milo we obtained some specimens of Lepidodendron which seem to be *L. primævum*, Rogers, but present the curious peculiarity of having the leaf-bases depressed, instead of being prominent (see remarks on this by Dr. J. W. Dawson in the Quarterly Journal of the Geological Society, May, 1881). In the same quarry carbonized remains of immense fern petioles five inches broad and several feet long occur. *Fucoides graphica*, Hall, abounds in the argillaceous strata, and a magnificent specimen of *Spirophyton, sp.?* was found in the upper shales. *Lunulicardium ornatum*, Hall, occurs sparingly. "Cone-in-cone" and pyritiferous nodules of curious shapes occur in the Big gully. *Cardiopsis robusta*, Hall, is met with quite frequently. Mr. Wm. Buxton, of Milo Center, has found three fine specimens of *Plumalina plumaria*, Hall, in the uppermost shales. One of the specimens is fourteen inches long. We have never found *Spirifera lævis*, Hall, though ever on the look-out for it.

At the Whitaker quarry, in the town of Milo, we discovered a fern which Dr. Dawson has indicated as a new genus. The following is his description taken from the Quarterly Journal of May, 1881:

ASTEROPTERIS NOVEBORACENSIS.

PLATE XV — Figs. 6–15.

"The genus *Asteropteris* is established for stems of ferns having the axial portion composed of vertical radiating plates of scalariform tissue imbedded in parenchyma, and having the outer cylinder composed of elongated cells traversed by leaf-bundles of the type of those of *Zygopteris*."

"The only species known to me is represented by a stem 2·5 centimetres in diameter, slightly wrinkled and pitted externally, perhaps by traces of aerial roots which have perished. The transverse section shows in the center four vertical plates of scalariform or imperfectly reticulated tissues, placed at right angles to each other, and united in the middle of the stem (figs. 1–4). At a short distance from the center each of these plates divides into two or three, so as to form an axis of from ten to twelve radiating plates, with remains of cellular tissue filling the angular interspaces (fig. 3, *b*). The greatest diameter of this axis is about 1.5 centimetres. Exterior to the axis the stem consists of elongated cells (fig. 7), with somewhat thick walls, and more dense toward the circumference. The walls of these cells present a curious reticulated appearance, apparently caused by the cracking of the ligneous lining in consequence of contraction in the process of carbonization. Imbedded in this outer cylinder are about twelve vascular bundles (figs. 2, 3, *d*), each with a dumb-bell-shaped bundle of scalariform vessels inclosed in a sheath of thick-walled fibres. Each bundle is opposite to one of the rays of the central axis. The specimen shows about two inches of the length of the stem, and is somewhat bent, apparently by pressure at one end."

"This stem is evidently that of a small tree-fern of a type, so far as known to me, not heretofore described,* and constituting a very complex and symmetrical form of the group Palæozoic Ferns, allied to the genus *Zygopteris* of Schimper. The central axis alone has a curious resemblance to the peculiar stem described by Unger ("Devonian Flora of Thuringia") under the name of *Cladoxylon mirabile;* and it is just possible that this latter stem may be the axis of some allied plant. The large aerial roots of some modern tree-ferns of the genus *Angiopteris* have, however, an analogous radiating structure."

The specimen is from the collection of Berlin H. Wright, Esq., of Penn Yan, New York, and was found in the Portage group (Upper Erian) of Milo, New York, where it was associated with large petioles of ferns and trunks of *Lepidodendra*, probably *L. chemungense* and *L. primævum.*"

"In previous communications to the society I have described three species of tree-ferns from the Upper and Lower Devonian of New York and Ohio; and this species is from an intermediate horizon. All four occur in marine beds, and were, no doubt, drift-trunks from the fern-clad islands of the Devonian sea. The occurrence of these stems in marine beds has recently been illustrated by the observation of Prof. A. Agassiz, that considerable quantities of vegetable matter can be dredged from great depths in the sea on the leeward side of the Caribbean islands. The occurrence of these trunks further connects itself with the great abundance of large petioles (*Rhachiopteris*) in the same beds, while the rarity of well-preserved fronds is explained by the coarseness of the beds and also by the probably long maceration of the plant-remains in the sea-water."

Nowhere in the county does the rock change in character sufficiently to warrant the sub-divisions which Prof. Hall gives to this group in Livingston and Alleghany counties. The entire thickness of the group in Yates county cannot be less than 1,000 feet.

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* Prof. Williamson, to whom I have sent a tracing of the structure, agrees with me that it is new.

Genesee Slate.

The next formation in the natural order downward is the Genesee slate. This extends the entire length of the county from north to south, and there are many fine exhibitions of the entire thickness of the dark, fissile carbonaceous shales, but the fossil remains are but sparingly distributed. In a ravine near Shingle point, on Seneca lake, there is a stratum about two feet thick, and near the middle of the formation, which abounds in fossils, among which are the following:

Lepidodendron, sp.? Very large and fine.
Goniatites, sp.? Very large and fine.
Leiorhynchus quadricostata, Vanuxem.
Lingula spatulata, Vanuxem.
Discina Lodensis, Vanuxem.
Discina truncata, Hall.
Also a large number of small gasteropods.

Septaria of all sizes from a few inches to two feet in diameter and of many curious shapes occur plentifully. The major part of them are over ten inches in diameter and flattened. They usually contain cavities which are lined with crystals. Usually the calcareous filling in the septæ and the body are worn away unequally, producing many curious forms, and many of the people along the exposure of these shales possess their "petrified turtles."

This is the first formation encountered in passing down the outlet of Lake Keuka (Crooked lake). At Randall's Mills these shales form an abrupt cliff seventy feet high and intensely black. They extend to the Oil mill, a mile below where the water tumbles over a cascade of fourteen feet, formed by the Tully limestone.

FAULT IN THE OUTLET OF LAKE KEUKA.

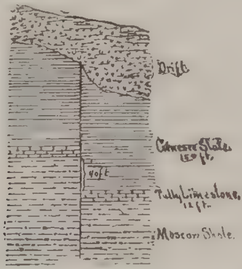


FIG. 3.— Section in outlet of Lake Keuka, showing a fault of forty feet which occurs near the Oil mill.

It seems proper at this point to describe what we believe to be a fault which occurs in strata at the outlet.

At the Oil mill the Tully limestone and Genesee slate are almost level in an east and west direction, and incline very slightly to the south. This condition maintains throughout the outlet and in the ravines leading thereto wherever they are visible. The Tully may be traced for many rods below the Oil mill, standing out in bold relief while the shales above and below it crumble away. It disappears, having "run out" and for about one-half mile we find the upper portion of the Hamilton group (the Moscow shale) filled with its characteristic fossil remains. One mile further down and forty feet lower we again find the Tully with the Genesee slate above it and the fossiliferous blue Moscow shales beneath, all almost perfectly level. It is impossible to tell just where the fault occurs and its direction, owing to the superincumbent soil. In Bruce's gully, a little further down, it is quite apparent that the break occurs about twenty rods from the entrance, and possibly by removing a few tons of soil the line could be found. We should say that it followed the general direction of the outlet and was, perhaps, its originating cause.

Prof. S. G. Williams, of Cornell University, examined the locality with me and fully concurs in the opinion expressed.

Tully Limestone.

This formation varies in thickness from eleven to fourteen feet and is divided into from three to five well-defined layers, varying in thickness from one to four feet. The upper stratum is much the thinnest. The upper surface of the third layer at Bellona is covered with pits of many curious and suggestive shapes. Many people believe them to be veritable tracks, and this belief has been strengthened of late by reason of sensational accounts of the wonderful "tracks of men, children, dogs, cows, mastodons," etc., which have been published by a correspondent of a Rochester paper, who took plaster casts of some of the mastodon and human (?) tracks and sent them to editors and scientific men.

It is evident that the "tracks" are solely the result of the eroding action of the elements. Water has, without doubt, been confined in its course between these layers.

It is a fact that these cavities do, in many instances, bear a striking resemblance to the tracks of men and animals. We have walked for a rod or more, taking natural strides and stepping in well-fitting pits each time.

At several places the Tully limestone is much flexed; at Bellona the dip to the N. is 4°. In the town of Starkey it is undulatory.

The two upper layers have a remarkable growth of corals. At Bellona the following abound: *Alveolites Goldfussii*, Billings, *Favosites Argus*, Hall, *Zaphrentes simplex*, Hall, *Heliophyllum Halli*, Edw. and

Haime and *Cystophyllum Americanum*, Edw. and Haime. There is also a form that resembles the last in structure, but is greatly flattened and attains a length of two feet. Where these corals occur the limestone is so impure as to be hardly worthy of the name, being dark, loose and "rotten." No brachiopods or other fossils are found with the corals.

The third layer contains a few fossils; the fourth and fifth many. It is useless to look for *Rhynchonella venustula*, Hall, above the lowest layer. They are most frequently found within a foot of the base, accompanied by a small, circular, flattish species of Atrypa. This seems to be what Mr. Vanuxem named *A. lentiformis*, and which has been considered by more recent authors as identical with *A. reticularis*, L. Although the two agree perfectly in markings, we have never, among thousands of the latter species, found one that agreed with the former in shape. Nor have we ever collected from the Tully a specimen of Atrypa larger than a half-grown *A. reticularis*, such as are found in the shales below. The *A. lentiformis*, Vanuxem, is always less ventricose, smaller and more nearly circular. *Orthis Tulliensis*, Van., occurs with *R. venustula* also, but more sparingly than the last, and we have never found either above or below the Tully. *Loxonema nexilis*, Phill., is not uncommon. *Proetus marginalis*, Con., has been found here.

Mr. William Buxton found a very fine specimen at Bellona, resembling *Nautilus magister*, Hall, but it does not enlarge so rapidly; also a fine *Cyrtoceras, sp.?* Mr. William Coon, of Milo Centre, N. Y., found the largest and most perfect Orthoceras we have ever seen from Devonian rocks, in the Tully limestone at Bellona. These are the only Cephalopods we have seen or known of having been found in the Tully limestone in this county.

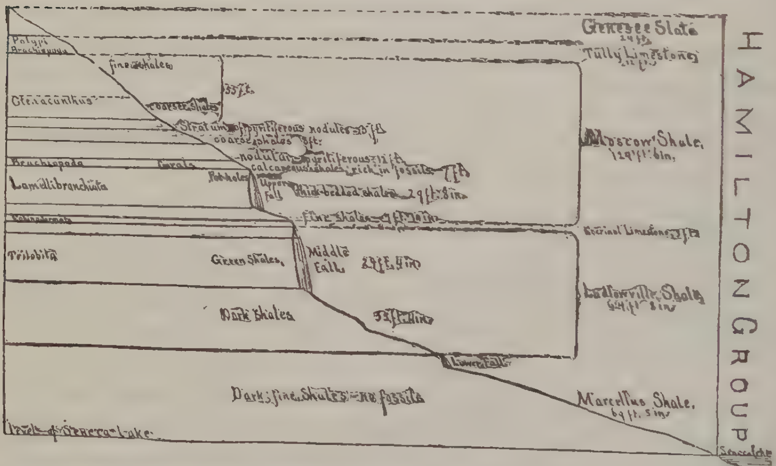
There is a cave of considerable size in a gully near the "Old Friend House" in the town of Torrey. The entrance is only large enough to admit a small boy, and children have crawled in a distance of fifteen or twenty feet, projecting in front of them a long pole with a torch at the end, thus being enabled to see a considerable distance and to observe side chambers. About a rod from the entrance there is a sudden contraction of the passage-way which prevents further progress, but it enlarges greatly beyond this point. Some fine stalactites have been taken from beneath the limestone.

Moscow Shale.

This formation is finely exposed in Yates county, appearing in Kashong creek in the town of Torrey, formerly the shore line of Seneca lake, as far south as Shingle point, and cropping out in the outlet of Lake Keuka. Near Hopeton, is an outlier which was once an island in the outlet of Lake Keuka. This is called the "Sugar Loaf." On the west and south sides of Sugar Loaf, which is about sixty feet high, the rock is free from soil, and certain fossils may be collected there in abundance. The top is capped with the Tully limestone, which projects several feet beyond the shales beneath. Frequent calcareous layers about two inches thick occur here. These consist wholly of fossil remains. The following are abundant at Sugar Loaf: *Athyris spiriferoides*, Eaton; *Atrypa reticularis*, Linn.; *Chætetes fruticosus*, Hall; *Strombodes distorta*, Hall; *Streptelasma rectum*, Hall; *Amplexus sp.?* *Spirifera granulifera*, Hall; *S. medialis*, Hall, and *S. mucronota*, Con.

The finest exposition of this formation and also of the succeeding Encrinal limestone, Ludlowville and Marcellus shales, is in Kashong creek, in the town of Benton. Here all the fossils found elsewhere in the county (below the Portage) occur, and many not found in other localities. As the remaining formations of Yates county are best seen in Kashong creek, we invite attention to that locality.

KASHONG CREEK.



Section along Kashong creek, from near Bellona to Seneca lake. Vertical scale, 124 ft. to 1 inch. Horizontal scale, ½ mile to 1 inch

This creek has its source in the swampy lands in the western part of the town of Benton and has, at two different periods, been the channel through which the waters of Lake Keuka have reached Seneca lake. By the map it will be seen that it has its origin in the Portage group, and runs through all the lower formations in the county. A few rods south of Bellona the Genesee slate and Tully limestone appear near an old saw-mill.

After leaving this point on the route to Seneca lake through Kashong creek, we first descend through fifty-five feet of nearly horizontal shale, occasionally interrupted by layers of sandstone. In this, and about two-thirds the distance down, we found the spine of a new species of Ctenacanthus, the description of which, by Dr. J. S. Newberry, is herewith published for the first time. [See end of this paper.] This stratum terminates in a bed of pyritiferous shales. This is followed by eight feet of coarse shales, which are remarkably rich in Strophodonta, and is succeeded by another layer of pyritiferous nodules twelve feet thick, and this by seven feet of calcareous shales, exceedingly rich in well-preserved fossil remains, though in a portion of this layer (the argillaceous shales) fossils are abundant, it is difficult to obtain perfect specimens. In the calcareous layers, which are from two to eight inches thick, fossils are most common and can usually be obtained free from gangue. The following are very plentiful:

Tropidoleptus carinatus, Conrad, *Chonetes mucronata*, Hall, *Orthis Vanuxemi*, Hall, *O. leucosia*, Hall, *Spirifera granulifera*, Hall, *Modiomorpha concentrica*, Conrad, *M. macilenta*, Hall, *Atrypa reticularis*, Linn, *Michelinia stylopora*, Eaton, *Mytilarca oviformis*, Con. Several species of undescribed fossils in the genera *Pterinea*, *Aviculopecten*, *Platyostoma*, *Loxonema*, *Fenestella*, *Fistulipora* and *Alveolites*.

Fragmentary portions of *Phacops rana*, Green, and *Dalmanites Boothi*, Green, are very common also, but perfect specimens of the former are not common, and of the latter only three have been found here that we are aware of. The articulations of *Homalonotus Dekayi*, Green, are frequently found, but Mrs. B. H. Wright and Wm. Buxton have found the only heads (two) that we know of from this locality.

This stratum continues to the brink of the first fall where the character of the rock changes from a loose calcareous shale to solid, compact layers of a lighter color. Here occur several pot-holes, one of which is two feet in diameter and the same in depth. These are near the brink of a fall of nearly thirty feet. In the lower portion of this layer are some fine Cypricardites, with most of the species found above. Then follows a calcareous stratum seven feet thick, containing many crinoidal fragments. This rests upon the ENCRINAL LIMESTONE, which is about three feet thick and forms the brink of the middle fall of twenty-nine feet. This Encrinal limestone is quite hard, takes an excellent polish, and being made up almost wholly of crinoidal stems and rays, makes a fine polished slab. There is but one brachiopod which is plentiful in this limestone.

Pentamerella papilionensis, Hall, *Eridophyllum Verneuilianum*, Ed. and H. and *Diphyphyllum gigas*, Rominger, are very plentiful also. Among the crinoids are several undescribed species, see *Dolatocrinus* *liratus*, Hall, and *Megistocrinus depressus*, Hall. Fine gasteropods are plentiful throughout this and the preceding formations, but are best preserved and obtained in best condition in this limestone. Among the commonest are *Pluerotomoria filitexta*, Hall, *P. Itys*, Hall, *Macrocheilus Hamiltoniœ*, Hall, *Platyostoma lineata*, Conrad, *Platyceras Thetis*, Hall, *P. symmetricum*, Hall, and *P. carinatum*, Hall.

After making a detour around the falls it is at once apparent that we are in a different formation, by the greenish color of the shales.

We believe that all of the fossils found in this formation, the LUDLOWVILLE SHALE, are found in the higher beds, but the reverse is far from being true. Brachiopods are quite scarce and there is a general thinning out of representatives of all the orders. These shales are succeeded by darker ones, thirty-five feet thick, containing nearly the same fauna. These continue to the lower fall, which marks the beginning of the dark, MARCELLUS SHALES, which continue to Seneca lake. The only fossil which is here plentiful in the Marcellus shales is *Orthoceras subulatum*, Hall.

The thickness of these formations was obtained by taking a series of levels from Bellona to Seneca lake. The results cannot be far from correct, as the dip in that direction is scarcely appreciable. My father, Dr. S. Hart Wright, a practical surveyor and engineer, assisted me in the work, and the results may be relied upon as correct.

NOTE.— The following description by Dr. J. S. Newberry, State Geologist of Ohio, is here published for the first time:

CTENACANTHUS WRIGHTI, n. sp.

Plate 16, figs. 1–3.

"Spine of large size, long-triangular in outline; anterior margin straight, laterally "compressed; medullary cavity large, opening posteriorly to the middle of the spine; above "this point the posterior surface is traversed by a strong elevated rounded ridge; denticles "small; directed backward; surface of exposed portion entirely covered with closely "pectinated ridges of nearly uniform width on the front and sides, becoming narrower and "less disinctly pectinated near the posterior margin.

"The spines of this species must have been very striking in their characters, both as re"gards form and markings. The anterior margin seems to have been absolutely straight "from base to summit. Along the line of junction between the enameled and buried por"tions the spine must have been two inches wide, but it tapered rapidly upward, terminating "in a slender, acute point. The exposed surface is more completely covered with ridges "similar in character, and the pectination is more crowded than in any other species known. "In its broad base, its general and uniform ornamentation, this spine has some resemblance "to *C. speciosus*, St. John, specimens of which have been in my hands; but the line of de"marcation between the ornamented and buried portions is less oblique, showing that the "position was more erect; the ridges are considerably coarser and the form is straighter. "The pectination is also less oblique and closer compared with the coarseness of the "ridges.

"*Formation and locality.*— Hamilton group, near the middle of the Moscow shale, Kash"ong creek, Yates county, New York, where it was obtained by Mr. Berlin H. Wright, "from whom it is named."

DESCRIPTIONS OF NEW SPECIES OF FOSSILS FROM THE TRENTON GROUP OF NEW YORK,

BY C. D. WALCOTT.

Genus GLYPTOCRINUS, *Hall.*

Glyptocrinus argutus, *n. sp.*

Plate 17, *fig.* 9.

Calyx small and somewhat pentangular from the depression of the interradial areas. Underbasals apparently obsolete. Basals five, pentagonal, more than twice as wide as high. Plates of first ring of primary radials wider than high, heptagonal, the upper margin slightly concave to receive the convex basal margin of the second series, the plates of which are hexagonal, their upper margin bearing the pentagonal plates of the third series of primary radials upon which the first bifurcation takes place. Fifteen plates above another bifurcation occurs, every alternate plate between bearing a rather long jointed pinnule that in very young specimens has the form of a small armlet.

Interradial area occupied by three series of plates of one, two and three plates respectively, above which none were observed. A single plate occurs between the first two plates above the first bifurcating plate.

Surface of plates a little roughened but not granulose.

Column of medium size, round, and formed of alternating thin and thick plates, the latter having a projecting denticulated margin.

The calyx of the specimen from which the above description is drawn has a width of 3.5 ^{mm}. at the summit, and a height of 2.25^{mm}. up to the first bifurcating plate. A specimen about three times as large has the basal plates a little higher in proportion to the width and the radial plates are marked by an elevated rounded ridge which bifurcates on the third radial. The upper series of interradials is also ornamented by three narrow crenulated ridges crossing each other at the center of each plate. A specimen intermediate in size to this, also the one figured, presents these characters in a slight degree.

Formation and locality. Upper portion of the Trenton limestone Trenton Falls, New York.

GLYPTOCRINUS ? SUBNODOSUS, *n. sp.*

Plate 17, *fig.* 3.

Calyx of medium size, obconical, interradial areas slightly depressed. Basal plates hexagonal, height and width subequal, the first interradial plate resting on the upper margins. First radial plate heptagonal, alternating with the basals. Second radials quadrangular and supporting above the third radials which are heptagonal and form the first bifurcating plate. A second bifurcation has not been observed, although thirty-two plates are shown above. Each alternate plate above the second bears a strong jointed pinnule.

Above the first interradial plate, which rests on the basal and between the two first radials there is a series of two, three and four, above which there are traces of two more rows. Two series of interaxillary plates, of one and two plates, respectively, occur above the third radial plate.

The surface of each radial plate is marked by a small node on the center of a narrow rounded ridge; the latter bifurcates on the third radial series, and also on the first, sending a branch to the center of the basals. The interradial plates have each a small node at the center, from which a low ridge radiates to each margin to meet those of the adjoining plates. The secondary radials have a light longitudinal ridge, when well preserved.

Column unusually large for a species of this character.

When the arms and pinnulæ are well preserved they give a peculiar bushy appearance when matted down over the calyx. In the position of the first interradial plate and the character of the arms this species departs from the typical form of *Glyptocrinus* and some other generic reference may ultimately be made of it.

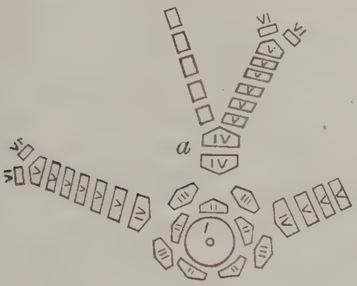
Formation and locality. Upper portion of the Trenton limestone, Trenton Falls, New York.

MEROCRINUS, *n. g.*

General appearance of the body not unlike that of some species of *Heterocrinus* and *Dendrocrinus.*

Underbasals pentangular, low and broad in the typical species. Basals hexagonal; radials pentagonal. Brachials six to seven in each ray, the upper plate pentagonal and supporting the free divisions of the arms above. In the right posterior ray there is a bifurcating plate resting on the radial below, and supporting above on its right sloping side the true brachial series of the arm, and on the left a row of quadrangular plates, vertically arranged. This series of plates resemble the brachial plates, except that they are more elongate. They undoubtedly formed the posterian side of an anal tube, corresponding in this respect to the same series of plates in the genus *Iocrinus.* Arms bifurcating frequently, gradually tapering. Pinnulæ unknown.

The arrangement of the plates forming the calyx is similar to that in *Dendrocrinus*, except that the regularity of the radial series of plates is not broken by the interposition of the anal plates. In this respect *Merocrinus* is allied to *Iocrinus*, and also in the position of the plates supporting the anal tube. It differs from *Iocrinus* in having a well-developed ring of underbasals, and also in the general appearance of the entire body.



The accompanying diagram gives the arrangement of the plates of the calyx and a portion of the arms.

i=Column. ii=Underbasals. iii=Basals. iv=Radials. v=Brachials. vi=Free arms. a=Plate supporting brachial plates and those of the posterior side of the anal tube.

MEROCRINUS TYPUS, *n. sp.*

Plate 17, *fig.* 5.

Calyx of medium size, broad at the base and gradually enlarging to a diameter one-third greater at the base of the arms.

Underbasals pentagonal, low and broad, very obtusely wedge-shape above. Basals hexagonal twice as wide as high, alternating with the underbasals below and the radials above. Radials pentangular, considerably broader than high, broadly wedge-shape at the base and narrowing slightly towards the upper margin.

The first right postero-lateral plate above the radial is pentagonal and supports the brachial plates on its right sloping side, and on the left the posterior wall of the anal tube. The brachial plates are quadrangular, broader than high. The first bifurcation of the right postero-lateral ray occurs on the sixth plate above the bifurcating plate below, and that of the left ray on the sixth plate above the radial ring of plates, each division again bifurcating on the ninth or tenth plate above.

The posterior plates of the anal tube are a little broader than high, decreasing in width towards the summit. The rounded posterior side of these plates gives this, the only portion of the anal tube observed, the appearance of an arm extending up between the true arms. Other portions of the anal tube not observed.

Surface of the plates slightly roughened.

The portion of the column attached to the calyx is formed of thin round plates closely united.

Formation and locality. Upper part of the Trenton limestone, Trenton Falls, New York.

MEROCRINUS CORROBORATUS, *n. sp.*

Plate 17, *fig.* 6.

Body slender, elongate. Calyx small, broad at the base, increasing slightly in width above.

Underbasals pentagonal, of medium size, and having a transverse diameter twice as great as the height. Basals larger, broadly hexagonal, alternating with the underbasals, and supporting above the pentagonal radial plates which have their width and hight subequal and their lateral margins scarcely uniting in the type specimen. The first plate, above the radial, of the right postero-lateral ray, is pentagonal and supports the brachial plates and the posterior plates of the anal tube as in *Merocrinus typus.* The anal plates being much more slender, but not showing any evidence of the attached portions of an anal tube, such as exists in the genus *Iocrinus.*

The arms are slender and bifurcate as in *Merocrinus typus.*

The column near the calyx is formed of thin round plates, the plates gradually increase in thickness below until it nearly equals one-half of their transverse diameter.

The anterior side of both this and the preceding species is unknown.

Formation and locality. Trenton limestone, Trenton Falls, New York.

GENUS IOCRINUS, *Hall.**

Two species of this genus have been described. *I. crassus* and *I. subcrassus* from the Hudson River Group of Illinois and Ohio. *I. subcrassus* is distinguished from *I. crassus* by its smaller size, different aspect of the arms and less robust appearance while the Trenton limestone form of New York has more slender arms, a less robust appearance than *I. subcrassus*, and it also occurs at a lower geological horizon, and at a distant locality. In many respects, however, the three forms are but varieties of one species. At present it is convenient to designate them by separate names.

IOCRINUS TRENTONENSIS, *n. sp.*

Plate 17, *figs.* 7, 8.

This species agrees so closely in all essential characters with *Iocrinus crassus and I. subcrassus*, that a detailed description is unnecessary.

The small pentagonal basals alternate with the large pentagonal radials which have their upper margins broadly truncated. Brachials four or five in each ray, the upper plate supporting the first division of the arms. In the right posterior ray, a pentagonal bifurcating plate rests on the radial below, and supports the brachial plates on its right sloping side above, and also a row of quadrangular plates on the left side. These plates form an elevated ridge, and support two thin, curved, broad plates that unite opposite the posterior ridge, where there is a smaller ridge. These plates are concave between their upper and lower margins, which gives a peculiar annulated appearance to the anal tube. This is usually well preserved, and gives a decided character to the species. The arms are slender and bifurcate frequently the plates constituting them all projecting at the upper edge.

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* As defined by Wachsmuth and Springer.

This species is not uncommon at Trenton Falls, in the upper half of the Trenton limestone, and is usually associated with *Heterocrinus simplex and H. laxus.*

Formation and locality. Trenton limestone, Trenton Falls, N. Y.

GENUS DENDROCRINUS, *Hall.*

DENDROCRINUS RETRACTILIS, *n. sp.*

Plate 17, *fig.* 4.

Calyx small, obconic.

Underbasals pentagonal wider than high. Basals hexagonal, the posterior plate not showing in the specimens at hand.

Radials broadest at the base, sloping a little from each side towards the summit, those of the anterior and antero-lateral rays pentagonal and slightly wider than high. Six or seven brachials occur in each arm to the first bifurcation. The posterior side of the body is concealed in the matrix.

Arms long and slender, giving off, above the first bifurcation, at intervals of nine or ten arm plates, divisions which are more slender than the continuation of the arm. Although no pinnulæ are to be seen, in the specimen there is a small proturberance with a cicatrix upon it on the inner side of each plate composing the arms.

The lower portion of the anal tube is shown by the presence of minute plates in the interbrachial spaces; it continues up above the plates as a compressed spiral, formed of a single series of elongate narrow plates or joints which probably supported a tubular extension of the anal tube. That it was capable of being extended out beyond the limits of the arms, is shown by its present position and character.

This species has a general resemblance to *Dendrocrinus Dyeri*, Meek, but differs in the calyx and arms.

Formation and locality. Trenton limestone, Trenton Falls, N. Y.

Genus CALCEOCRINUS, *Hall.*

Calceocrinus Barrandii, *n. sp.*

Plate 17, *figs.* 1, 2.

Body small, somewhat flattened on the dorsal and rounded on the ventral side. The swelling of the right dorso-lateral plate near its basal margin gives a constricted appearance to the body about midway of its length, when viewed from the dorsal side.

Basal plate short, sub-triangular. First dorsal plate elongate, slightly concave on the lower margin, and narrowing upward to a point near the summit of, and between, the dorso-lateral plates. The dorso-lateral plates are large and support the dorso-radial plates upon which rest the brachial plates of the dorsal arm.

The dorsal arm consists of a single series of subcylindrical plates. The first plate above the dorso-lateral plate is broader than high, and supports a pentagonal brachial plate upon which the arm bifurcates, the left branch bifurcating again on the sixth plate, and the right or ventral arm on the second plate, and again on the first and second above: the branches again subdividing near their upper extremities. Surface of body and arms granulated. Column round, composed of rather thick, slightly rounded plates.

Owing to the anchylosing of the plates of the body, it is difficult to determine their outline. The description is drawn from two specimens, each showing the dorsal and right dorso-lateral sides.

The species resembles *Calceocrinus* (*Heterocrinus*) *articulosus* Billings, but varies in the arrangement of the plates of the ventral arms.

The specific name is given in honor of the eminent palæontologist of Bohemia.

Formation and location. Upper portion of the Trenton limestone, Trenton Falls, N. Y.

Genus METOPTOMA—*Phillips.*

Metoptoma Billingsi, *n. sp.*

Plate 17, *figs.* 12, 12*a*.

Oval, subconical; apex at the most elevated point on a line with the anterior margin. The outline from the posterior margin to the apex is regularly convex, and from the apex to the anterior margin, slightly concave. The posterior margin has a slight undulation near its center.

Surface marked by shallow undulations and lines of growth parallel to the margin.

Length of shell, 26 mm., width, 20 mm., hight, 20 mm.

The specific name is given in honor of the late Mr. E. Billings, Palæontologist of the Geological Survey of Canada.

Formation and locality. Birdseye limestone, Buck's Quarry, Russia, Herkimer Co., N. Y.

GENUS BEYRICHIA—*McCoy.*

BEYRICHIA BELLA, *n. sp.*

Plate 17, *figs.* 11, 11*a.*

Carapace large as compared with associated species. Length, 3.75 mm., width, 2 mm. at the broadest part near the center. The hinge line is straight and shorter than the length of the valves, each end projecting. The center of the valve is strongly convex, and separated from the margin by a narrow channel; a strong deep sulcus crosses the valve obliquely from the dorsal to the ventral margin, separating a large convex lobe on the anterior half : a second sulcus, not as deep as the anterior, crosses from the posterior third of the dorsal margin, and unites with the anterior sulcus two-thirds of the distance between the dorsal and ventral margins, separating a subtriangular lobe adjoining the dorsal border and a narrower elongate strongly convex lobe on the posterior portion; this lobe is crossed by a transverse furrow near the dorsal end, which separates a small depressed lobe within the postero-dorsal angle.

Surface finely granulose under a strong magnifying power.

Beyrichia decora and B. venusta Billings of the silurian of anticosti belong to the same group as *B. bella.*

Formation and locality. Upper portion of the Trenton limestone, Trenton Falls, N. Y.

GENUS LEPERDITIA, *Roualt.*

SUBGENUS ISOCHILINA *Jones.*

LEPERDITIA (ISOCHILINA) ARMATA, *n. sp.*

Plate 17, *fig.* 10.

Carapace elongate, moderately convex; length, 8.5 mm., width, 5 mm. Hinge line straight to the lateral angles of the valve where it curves up and unites with the projecting lateral margins to form the produced anterior and postero-dorsal angles; anterior extremity broadly rounded; ventral curve uniform : posterior extremity obliquely rounded to the ventral curve. From the point of greatest convexity on the lower central half of the valve a strong unciform-shaped spine projects obliquely outward, the apex extending beyond the ventral margin and curving toward the anterior extremity of the valve; the section of the spine at the base is elliptical, becoming sharply angular on the posterior side as it nears the apex.

Surface of the valve and spine black, shining, smooth to the eye, but under the magnifier slightly elevated inosculating lines appear, radiating from the muscle spot; the interspaces are minutely punctate.

It is associated with *Leperditia fabulites* and varieties of *L. Canadensis.*

Formation and locality. Birdseye and Black River limestones, Buck's Quarry, Russia, Herkimer Co., N. Y.

PRELIMINARY NOTICE

OF THE LAMELLIBRANCHIATE SHELLS OF THE UPPER HELDERBERG, HAMILTON AND CHEMUNG GROUPS.

[Preparatory for the Palæontology of New York.]

PART 1.

The fossil Lamellibranchiata of the higher groups of the New York geological series are often abundant, of great variety of form and of very interesting character. Our earlier knowledge of these fossils is almost wholly due to Mr. Conrad, who described eleven species in the Annual Report of the Geological Survey in 1838; and during the following years this work was continued, both in the Annual Reports of the Survey and in the Journal and Proceedings of the Academy of Natural Sciences of Philadelphia. The total number of species described by Mr. Conrad from all the groups is about one hundred and ten, and fifty of these have been illustrated in the publications of the Academy. The number of species at present known from the same formations is about six hundred, of which nearly five hundred are from the groups above the Oriskany sandstone.

During and since this period the writer has made extensive collections of these fossils, both with his own hands and through the agency of his assistants, preparatory for publication in the Palæontology of New York. After having accumulated considerable collections, and feeling the importance of their proper identification, I engaged Mr. Conrad to examine the whole and to give his determination of the species which he had described. On three several occasions, previous to 1865, Mr. Conrad visited Albany for the express purpose of making these determinations and identifications, labeling one or more of each of those which he recognized as typical forms of the species. Through these means, and by later study and comparison, it is believed that nearly all the previously described forms have been satisfactorily determined.

In 1869 the writer printed and published "Preliminary Notice No. 2, of the Fossil Lamellibranchiate Shells of the Upper Helderberg, Hamilton, Portage and Chemung groups," etc., to the number of eighty pages, issued in December of that year. One hundred copies in this form were distributed. In January following the printing was resumed, and sixteen additional pages were printed. The pamphlet thus augmented, with a supplementary page stating the fact that the descriptions of other species were in type, was distributed to the public.

It had been the intention of the author to incorporate that Preliminary Notice in the Twenty-third Annual Report of the State Cabinet of Natural History, with a preparatory Note making due acknowledgments for sources of aid and information, and giving the reason for the appearance of No. 2 in advance of No. 1. This report (23) was, however, not published till 1872.* In the mean time the burning of the State printing establishment destroyed the material in the hands of the printer† (leaving some proof-sheets only in the hands of the author). No effort was afterward made to resume and complete the intended work, and the paper still remains incomplete.

The Notice No. 2 was first printed because the investigations upon the genera there included were farther advanced; while comparatively little had been done in arranging the groups preceding those described. It had been the intention to follow Notice No. 2 with the early publication of No. 1, but owing to failing health in 1871, which compelled a cessation of work, and finally an entire absence from my duties, the work was not resumed till a later period. In the mean time the volume V, Part 2 of Palæontology, including the Gasteropoda, Pteropoda and Cephalopoda, originally intended to follow the Lamellibranchiata, has been published. The publication of the Lamellibranchiata should have followed this volume directly, but the continued delay in authorizing the publication of the work induced the author in January, 1883, to issue one hundred copies of the plates, long since completed, with a list of the names of the species proposed. This volume has now been before the public for nearly a year.

Since the publication of Preliminary Notice No. 2, a more critical study of the forms included in the present paper has shown the imperative necessity of a revision and rearrangement of the species in reference to the genera to which they had in many cases heretofore been referred, and to the proposing of several new generic terms which the author believes will facilitate the work of the student in his investigations in this class of fossils.

In the preparation of the former paper, the author was very efficiently aided by Mr. R. P. Whitfield, then an assistant in the State Museum, to whom he expresses his obligations. In the preparation of the present publication, together with the previous revision of the species in their generic relations to Pectenidæ, Aviculidæ, etc., he has been indebted for the very valuable assistance of Mr. C. E. Beecher, now an assistant in the State Museum.

At the present writing, the volume of the text on the Lamellibranchiata is in press and the printing is essentially completed.

The following Preliminary Notice No. 1 of the Lamellibranchiate shells of the Upper Helderberg, Hamilton and Chemung groups was originally communicated with the Thirty-fourth Report of the State Museum, at the beginning of 1881, and should have been printed during that year. This, together with several other papers which were communicated with the Thirty-third and Thirty-fourth Reports, were not printed in the published documents, and were afterward withdrawn and again communicated with the Thirty-fifth Report, of which this paper forms a part.

ALBANY, *January*, 1884.

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* 1873 on title page is an error of the printer.

† See Twenty-third Report on the State Cabinet Museum, page 249, 1872.

PRELIMINARY NOTICE

PART 1.

MONOMYARIA.

DESCRIPTIONS OF SPECIES.

GENUS AVICULOPECTEN (McCoy).

SECTION *a*.

AVICULOPECTEN PRINCEPS.

Monotis princeps, CONRAD. Annual Report N. Y. Geolog. Surv., p. 117. 1838.

Avicula parilis, CONRAD. Proceedings Acad. Nat. Sci. Phila., vol. 8, p. 239, pl. 112, fig. 9. 1842.

Compare *Aviculopecten Sanduskyensis*, MEEK. Proceedings Acad. Nat. Sci. Phila., p. 161. 1871.

Compare *Avicula parilis*, CONRAD ? MEEK. Palæontology, of Ohio, vol. 1, p. 197. 1873.

Compare *A. pecteniformis*, CONRAD. Jour. Acad. Nat. Sci. Phila., vol. 8, p. 240, pl. 12, fig. 14. 1842.

Aviculopecten princeps (CONRAD) HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, figs. 18, 19, 23, 24; pl. 24, fig. 7. Jan., 1883.

Aviculopecten Sanduskyensis (MEEK) HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, figs. 10, 11. Jan., 1883.

SHELL large, obliquely broad-ovate; axis inclined more than 60° to the hinge-line; length and height nearly equal, varying within moderate limits; anterior margin convex; the convexity increasing to the middle of the postero-lateral side, thence truncated and extending in a straight line to the beak, making an angle of from 30° to 40° with the hinge-line. Valves depressed; left valve regularly convex; right valve nearly flat, or very moderately convex.

Hinge-line straight, having a length of from two-thirds to more than three-fourths the length of the shell, and extending anteriorly as far as the antero-lateral margin with little variation. Beaks obtuse, rounded, anterior to the middle of the hinge. Umbo subtending an angle of about 130°. Ears large, triangular; posterior one the larger, and defined by the abrupt slope of the side of the umbo, while the anterior ear is separated by a distinct sulcus; lateral margins concave, becoming convex at the hinge-line. Byssal sinus broad, rounded, well-defined and indicated on the ear by a sulcus extending to the extremity of the beak. The right valve is flatter and proportionally broader than the left. The limits of the ears are clearly indicated by the rapid slope of the umbo, and the absence of strong radiating lines of ornamentation.

Test thin, marked by numerous regular alternating rays, which increase in number by interstitial additions, and become broader and stronger toward the margins. These radiating ribs are crossed by very fine, sharp striæ of growth. On the ears the rays are nearly obsolete, and the lines of growth are sharper and stronger than on the body of the shell.

The internal mould shows a simple, continuous pallial impression, extending nearly parallel to the margins, and terminating in a large sub-ovate muscular impression, which is posterior to the middle of the shell. The cavity beneath the beak extends over the ligamental area at that point, forming the cartilage-pit. In young individuals the ligamental area shows three or four small furrows at the beak, extending toward the extremities of the hinge-line. Three of these furrows measure 2 mm. across. In larger and older individuals, this furrowed ligamental area is much more marked, having frequently a width of 5 mm., and extends the entire length of the hinge, showing more numerous furrows. At the beaks the furrows are bent slightly outward, otherwise, with gentle undulations, they run parallel to the hinge-line. This feature is a constant character in this and several other species, and is similar to that in many forms of PTERINEA and LYRIOPECTEN.

The dimensions of the shells of this species are very variable. Large individuals have a height of 80 mm. with nearly equal length, and a hinge-line of 50 mm. The graduation from this form is very gradual to those in which the height is equal to, or greater than, the length, and where the length of the hinge-line is nearly equal that of the shell.

This species differs from *A. pecteniformis* by larger anterior ears, with more numerous and less prominent rays on the body of the shell In specimens identified as *A. Sanduskyensis* the umbo is more inflated and obtuse, while the length is uniformly greater than the height. *A. scabridus*, which in some respects resembles this species, is clearly distinguished by its characteristic surface-ornamentation and the proportionally greater height of the valves.

This is one of the largest and most abundant species in the lower and middle portions of the Hamilton group. It is very easily distinguished by the large ears with the furrowed ligamental area, full, obliquely ovate outlines, and characters of ornamentation.

Formations and localities. In limestone referred to the age of the Upper Helderberg group (Corniferous limestone), at Sandusky, Delaware, and near Columbus, Ohio, and also at the falls of the Ohio; in the coarser shales of the Hamilton group, at numerous localities in the eastern and central portions of the State; in the upper soft calcareous shales of the group at Moscow, Livingston county, N. Y., and very rarely in the western extension of the group.

AVICULOPECTEN PECTENIFORMIS.

Avicula pecteniformis, CONRAD. Jour. Acad. Nat. Sci. Phila., vol. 8, p. 240. 1842.

Aviculopecten pecteniformis (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 1, fig. 9. Jan., 1883.

SHELL sub-ovate oblique, to the hinge-line; length equal to the height; anterior and basal margins regularly rounded, the body of the shell extending in a nearly straight line from the postero-lateral margin to the beak. Left valve convex, reaching its greatest convexity at about one-third the length of the valve from the beak. Right valve not observed. Hinge-line straight, having a length of more than two-thirds the length of the shell. Umbo prominent, sloping rapidly to the ears; the sides subtending a little more than a right angle. Beak prominent, situated a little anterior to the middle of the hinge. Ears triangular, unequal, the anterior about one-half the size of the posterior one, lateral margins concave.

Test ornamented by about 35 sharp, strong rays, with intermediate finer ones, which are crossed by fine imbricating striæ of growth. The radii are not present on the ears.

The original of this species has a length of 47 mm. with an equal height. The hinge-line measures 27 mm.

This form may be distinguished from *A. princeps* by its smaller anterior ear, and less expansion at the base of the ears. The umbo appears more contracted, and in the single known specimen is more prominent. The principal radii are sharper and stronger, and the alteration of smaller ones more regular.

In *A. exacutus*, which resembles this form, the beaks are nearer the middle of the hinge-line, and the shell has a distinctly reticulate surface ornamentation, with the radii continued over the ears.

Formation and locality. From the Corniferous limestone of the Upper Helderberg group, Schoharie, N. Y.

AVICULOPECTEN CLEON.

Aviculopecten Cleon, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, fig. 1. Jan., 1883. Compare with the young of *A. princeps*.

SHELL small, ovate; transverse axis slightly oblique; length somewhat greater than the height; margins regularly rounded. Left valve convex, the convexity equal to about one-sixth the length of the hinge-line. The point of greatest convexity is just anterior to the center of the shell and toward the beak. Right valve not observed. Hinge-line straight, length five-sixths the height of the entire shell. Beak anterior to the middle of the hinge, not prominent. Ears defined by the absence of radiating lines, but not by any marked change in the convexity of the shell; lateral margins concave. The anterior ear is limited by a shallow groove. The posterior ear is about twice the size of the anterior.

Test thin, ornamented by a reticulation of fine radiating lines, and finer concentric striæ of growth. The stronger rays have one or two finer lines between. The lines of growth extend over the ears, but less distinctly than over the body of the shell; and otherwise the ears are nearly smooth. The length of the specimen is 21 mm., height 24 mm., hinge-line 20 mm.

This form resembles the young of *A. princeps*, but it is less oblique and the ears less strongly defined than in the young of that species as represented in authentic specimens. The form *A. exacutus* is very similar to this one; but that species has fewer and sharper radiating striæ, and the geological horizons of the two are widely separated.

Formation and locality. Upper Helderberg limestone, Columbus, Ohio.

AVICULOPECTEN SCABRIDUS.

Aviculopecten scabridus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 3, figs. 3–12. Jan., 1883.

SHELL large, sub-circular, very slightly oblique to the hinge-line; length somewhat greater than the height: pallial margin circular, becoming very full posteriorly. Valves depressed, moderately convex. Hinge-line straight; length equal to two-thirds the length of the shell, marked by a thickening and inflection of the cardinal margins of the ears. Beaks obtuse, rising slightly above and arching over the hinge-line, situated just anterior to the middle; umbonal angle 110°. Ears narrow, triangular, indented by a sinus which has a depth equal to the width of the ears. The anterior ear of the left valve is one-half the width of the posterior, but of nearly equal length; in the right valve the ear is larger, and has a well-marked byssal sinus. The right valve is somewhat less convex than the left, but, with the exception of the deeper anterior sinus, is very similar in character.

Test ornamented by about sixty strong, rounded rays, with some smaller intermediate elevated lines, which are crossed by regular, prominent, subimbricating lamellæ of growth about 1.5 mm. apart. On crossing the rays, the varices of growth are bent suddenly upward and backward, forming short semi-tubular spines. The strong rays are absent upon the ears, but the lines of growth are numerous, and sharper than over the body of the shell. Numerous individuals have a height of 55 mm., with usually a slightly greater length. The length of the hinge-line in mature examples is about 45 mm.

This well-defined species is readily distinguished by the slight obliquity of the body of the shell to the hinge-line, and the marked characters of the surface. It differs from *A. princeps* and *A. pecteniformis* in having strong and regular concentric markings, while the rays in these species are much more acute, and the axis of the shell is usually quite oblique to the hinge-line.

Formation and localities. In the shales of the Hamilton group, at Pratt's falls, and Delphi, Onondaga county; Ludlowville, Cayuga county; Bellona, Yates county; Geneseo, Livingston county, and other places in western New York.

AVICULOPECTEN EXACUTUS.

Aviculopecten exacutus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 3, figs. 18–22. Jan., 1883.

SHELL of medium size, obliquely broad-ovate; greatest longitudinal diameter below the middle; height nearly equal to the length, transverse axis oblique to the hinge-line; basal margin full and regularly rounded; posterior margin extended beyond the ear, and more convex than the anterior. Valves equally convex; the byssal sinus larger in the right valve, and the umbo less ample. Hinge-line straight, length four-fifths the longitudinal diameter, extending nearly as far as the anterior margin. Beak obtuse, oblique, anterior to the middle of the hinge and of the valve; umbo ample. In some specimens of the left valve, the beak arches over the hinge-line, while in the right valve the beak rises from the hinge. Ears triangular; posterior one somewhat the larger, margin concave, extremity acute; defined from the umbo by a broad, shallow sulcus, an obscure carination, and an abrupt change in the surface characters to subdued striæ. The anterior ear is well-defined by the sulcus extending from the angular byssal sinus.

Test ornamented by about forty strong, sharp, continuous rays, alternating in size with broader and concave interspaces, crossed by fine, sharp, crenulating concentric striæ. The ears show finer concentric striæ and a few rays. Pallial line impressed, continuous, extending parallel to the margin of the shell about half way from the beak, terminating near the center of the posterior side, in a subcircular, muscular impression, marked with regular concentric striæ.

The largest specimen has a height of 35 mm. A medium-sized specimen has a height of 26 mm.; hinge-line 24 mm.

This species differs from the young of *A. princeps*, in its more acute beak, smaller anterior ears, and in having rays on both ears; the rays on the body of the shell are also stronger. It resembles *A. formio* in outline, but has more sharply elevated rays, and less strong concentric striæ. *A. pecteniformis* has obtuse rounded beaks, and ears not marked by rays, which are distinguishing features of that species.

Formation and localities. In the shales of the Hamilton group, Monteith's Point, Ontario county, and Hamburg, Erie county, N. Y.

AVICULOPECTEN FORMIO.

Aviculopecten formio, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, figs. 20, 21. Jan., 1883.

SHELL of medium size, obliquely ovate, extended behind; length equal to or somewhat less than the height. Valves depressed, slightly convex. The right and left valves are very similar; the right being somewhat less convex, and having finer surface markings. Hinge-line straight, extending as far as the anterior margin; length two-thirds the height of the shell; ligamental area narrow. Beaks well-defined, not rising above the hinge-line, situated anterior to the middle. Posterior ear large, triangular, margin concave; the ornamentation differing from that on the umbo; defined by a slight depression and a change of convexity. Anterior ear small, defined by a well-marked sulcus; byssal sinus deep; margin convex near the extremity of the hinge-line. The area of the posterior ear is more than twice that of the anterior.

Test ornamented by about 35 rounded, radiating costæ, with intermediate smaller ones, crossed and crenulated by regular striæ of growth, of which there are about 10 in the space of 5 mm. On the ears the radiating lines are present, especially on the anterior ear, and the concentric striæ are more crowded than on the body of the shell.

The largest specimen has a length of 32 mm., and the hinge-line measures 23 mm. A smaller specimen, preserving both valves, has a length of 29 mm., and height about equal.

This species is distinguished from *A. exacutus* by the greater angle subtended by the sides of the umbo, by its greater obliquity, and the less sharp radiating costæ of the surface. In *A. Phorcus* the length is comparatively greater and hinge-line shorter, the ears smaller, and the strong crenulating striæ of growth do not occur.

Formation and localities. In the shales of the Hamilton group, at Fultonham, Schoharie county, and Hamilton. Madison county, N. Y.

AVICULOPECTEN PHORCUS.

Aviculopecten Phorcus, HALL, Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, fig. 22. Jan., 1883.

SHELL of medium size, obliquely ovate; height and length equal; anterior and basal margins regularly rounded, becoming more convex toward the middle of the posterior side, and thence concave to the beaks, giving the shell an appearance of considerable amplitude behind. Left valve regularly and moderately convex. The right valve is unknown. Hinge-line straight, about one-half the length of the shell. Beak rounded, extending to and situated near the center of the hinge-line; umbonal angle smaller than usual, being about 90°. Ears comparatively small, triangular, with concave margins; posterior ear the larger, separated from the body of the shell by a difference in convexity and the absence of radiating lines; anterior ear defined by a sulcus.

Test marked by about 60 fine, rounded, radiating costæ, with a few intermediate smaller ones, and fine striæ of growth. The rays are absent on the ears, but the lines of growth are more distinct than on the body of the shell.

The specimen described has a height of 37 mm., and a greatest length of 26 mm.

This species differs from *A. formio* by its smaller ears, their distinct character, and the general surface markings. It resembles young individuals of *A. princeps*, but the comparative size and extent of the ears are very different, while the body of the shell is more constricted at the base of the ears. *A. fasciculatus* is very similar in the general form of the body of the shell; but the length is greater than the height. The alæ and the ornamentation of the test are distinguishing characters.

Formation and locality. Hamilton group, Schoharie, N. Y.

AVICULOPECTEN FASCICULATUS.

Aviculopecten fasciculatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, figs. 9, 10, 12, 16, 17. Jan., 1883.

Aviculopecten repletus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, figs. 13–15. Jan., 1883.

Aviculopecten Orestes, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, fig. 11. Jan., 1883.

SHELL obliquely and transversely ovate; height more than seven-eighths of the length, produced behind; pallial margins regularly rounded, becoming more convex toward the middle of the postero-lateral side, and extending in a straight or slightly concave line to the beaks. Valves moderately convex, the right one more depressed when seen in connection with the other, shorter and comparatively less oblique. Hinge-line straight; length nearly two-thirds the height of the shell; extending in young individuals as far as the anterior margins. Beaks prominent, well-defined, situated anterior to the middle of the hinge-line. Umbo very convex. Ears of the left valve triangular, the posterior one larger, more attenuate at the extremity, and defined by a sulcus; the margins concave from the rapidly sloping side of the prominent umbo. Ears of the right valve much narrower, and attenuate at the extremities, with fewer radiating lines, marked by a very deep byssal sinus.

Test ornamented with numerous filiform, radiating striæ, which are often fasciculate, and fine concentric lines of growth. The broad fascicles of striæ often extend across one interval of growth, and on the succeeding interval appear as regular or irregular striæ without aggregation, or as fascicles of finer striæ. In young specimens the rays are regular, with a slight fasciculate arangement. The concentric lines are sharper and more crowded on the ears and the rays are more subdued.

One specimen has a height of 30 mm., and a length of 32 mm.; another specimen has a height of 23 mm., and a length of 25 mm.; the hinge-line is 16 mm.

The form and surface markings distinguish this species. It differs from *A. formio*, *A. princeps* and *A. pecteniformis* in its surface markings; and from *A. princeps* especially, by the presence of radii on the wings.

Formation and localities. In the shales of the Hamilton group, Schoharie, Onondaga and Madison counties; also occurring in boulders of the coarse shales of the Hamilton group at Chemung Narrows, N. Y.

AVICULOPECTEN IDAS.

Aviculopecten Idas, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 3, figs. 1, 2; pl. 24, fig. 4. Jan., 1883.

SHELL ovate-orbicular, transverse axis slightly oblique to the hinge-line; height nearly equal to or greater than the length; outline full in front, not extended posteriorly. Right valve depressed; moderately convex. Left valve not observed. Hinge-line straight, length less than two-thirds the length of the shell, extending farther toward the anterior than the posterior margin. Beaks obtuse, well-defined, the umbo separated on each side from the ears by a distinct sulcus, which is more marked on the anterior side. The beaks are nearly in the center of the hinge-line, but somewhat anterior to the middle of the shell. Ears unequal. Anterior one about twice the size of the posterior, convex; margins convex; separated from the body of the shell by a deep sinus which is continued to the beak as a distinct sulcus. Posterior ear triangular, with margins concave.

Test thin, marked by fine, concentric lines of growth, and about 80 rounded, radiating striæ, which increase by interstitial addition, with the interspaces less than the striæ, of which there are from 7 to 9 in the space of 5 mm. at the pallial margin. The surface characters continue on the ears; but upon the posterior ear the radiating lines are very subdued, while on the anterior one they are quite prominent.

The largest specimen has a height and length nearly equal, and hinge-line of 20 mm. Another individual has a height and length of 27 mm., and hinge-line of 16 mm.

This species differs from *A. fasciculatus* in its comparatively larger anterior and smaller posterior ears, while the shell is less full behind, and the fasciculate surface has not been observed. In *A. formio* the posterior ears are much larger, and the surface is distinctly reticulate. *A. scabridus* the beaks are more rounded, the wings more extended, and the surface quite different. Some forms of *A. duplicatus* and *A. rugæstriatus* resemble this species; but the posterior ears of those species are larger, the anterior pair wider, and the surface marking characteristic.

A careful comparison with *A. Itys* reveals the following differences: *A. Itys* is less oblique in outline, radiating striæ less distinctly rounded, inclining to angular, distance between them greater than the striæ themselves; the evidence of the implication of intermediate striæ is obscure; the concentric lines are more distant and sharper, leaving the radii in the cast distinctly crenulate.

Formation and localities. In the Hamilton group at Fultonham, Schoharie county; shore of Cayuga lake, and Darien, Genesee county, N. Y.

AVICULOPECTEN LAUTUS.

Aviculopecten lautus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 3, figs. 16, 17. Jan., 1883.

SHELL obliquely ovate, height equal to the length, valves depressed, convexity of right and left valves sub-equal. Hinge-line straight, length about one-fifth less than the height of the shell, or in some specimens longer, extending as far as the anterior margin of the valve. Beaks depressed, obtuse, anterior to the center of the hinge-line. Ears sub-equal, triangular, flat, mucronate at the extremities, margins concave except in the anterior ear of the right valve, which is convex; defined by the umbonal carinæ, and by the absence of rays on the posterior slope. Byssal notch in the right valve angular, deep, continuing to the beak as a sulcus which separates the ear from the umbo. The right valve, though very similar to the left, is not so high, and the anterior ear differs in form from the corresponding one in the left valve.

Test thin, ornamented by about 90 sharp rays, with concave interspaces having an equal number of intermediate finer rays, and crossed by numerous regular, sharp concentric striæ. The markings on the ears are similar to those on the body, but less strong.

The left valve of one specimen has a height of 23 mm., length 24 mm., hinge-line 23 mm.; the right valve of the same has a height of 22 mm., and a length of 24 mm. A larger specimen is 29 mm. in height, with an equal length.

This species resembles *A. exacutus* in outline, but differs in the lesser convexity and obliquity of the valves; the beaks are not prominent and the surface characters are finer and more delicate. Young individuals of *A. scabridus* may be distinguished from this species by the more rounded and obtuse beaks, and rugose rays, which are usually absent on the ears. *A. formio* differs by its obliquity and the inequality of the ears, and the much stronger striæ.

Formation and localities. In the shales of the Hamilton group, at West Bloomfield, Ontario county, and York, Livingston county, N. Y.

AVICULOPECTEN RUGÆSTRIATUS.

Lima rugæstriata, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 264. 1843.
Aviculopecten rugæstriatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, figs. 8–11. Jan., 1883.

SHELL longitudinally ovate, oblique; more convex in front; height one-fourth greater than the length; outline oblique-ovate, with the posterior margin depressed convex; the anterior margin more convex, and the base abruptly rounded. Valves convex, very similar, except that the right valve shows an acute byssal sinus. Hinge-line short, straight, length more than one-half the length of the shell. Beaks acute, prominent, anterior to the middle of the hinge. Ears small, broad, triangular; posterior one a little the larger, margin slightly concave; anterior ear defined by a distinct sulcus, which is narrow and deep in the right valve, margin convex; byssal sinus deep and acute. The posterior ear is less distinctly limited in the right valve.

Test near the beaks ornamented by fine filiform rays, which are crossed and crenulated by sharp, concentric striæ. Below the middle of the shell, the rays become large rounded plications, increasing by implantation or bifurcation, and the regular concentric striæ are stronger, distinctly crenulating the rays, becoming foliate, and giving the surface a rugose appearance. The rays and concentric lines are present on the ears.

Two left valves have a height of 35 mm., and 22 mm.; length 29 mm. and 18 mm.; the hinge-line 16 mm. and 10 mm., respectively. A right valve of nearly the same proportions has a height of 33 mm., length 25 mm., and hinge-line 17 mm.

This species is distinguished from *A. duplicatus* by its comparatively greater height, the obliquity of the valve, and the acute beaks; the surface characters of the two are very similar. *A. cancellatus* is more circular in outline, and the anterior ears are larger than the posterior pair.

Formation and localities. Shales of the middle Chemung group, Philipsburg, Rockville and Hobbieville. Alleghany county, N. Y.

AVICULOPECTEN DUPLICATUS.

Pecten duplicatus, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 264. 1843.
Aviculopecten duplicatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, figs. 1–7. Jan., 1883.

SHELL ovate-orbicular, sub-equilateral; height usually less than the length; greatest length below the center of the shell, giving a somewhat truncated appearance to the base. Valves moderately convex; very similar in dimensions and convexity; the central position of the beaks makes the valves nearly equilateral. The right valve is marked by a deep byssal sinus. Hinge-line straight, central, length from more than one-half to two-thirds the length of the shell. Ligamental area narrow. Beaks rounded, obtuse, sub-central. Umbo prominent, ample. Ears small. Anterior larger and well-defined by the sulcus extending from the sinus to the beak. Posterior one small, triangular; margins concave. Byssal notch deep and abrupt.

Test ornamented with regular duplicating rays, which increase in strength toward the margins; crossed by fine, regular, foliate, concentric expansions of the test. In well-preserved specimens this character of surface gives a decided limate appearance, and somewhat resembles *A. rugæstriatus*. In weathered specimens this surface character is subdued to a reticulation and crenulation. Near the beaks the shell is nearly smooth; toward the margins it is sometimes marked by strong, rounded plications. The rays and concentric lines are continued over the ears, and the anterior ear usually has several stronger plications.

A medium example has a height of 27 mm., length 30 mm., and hinge-line 18 mm.

This species resembles *A. rugæstriatus* in surface characters, but it is less oblique and proportionally much longer, with beaks more obtuse. The outline of *A. cancellatus* is more nearly circular, and the direction of the transverse axis is oblique. From *A. scabridus* it differs in its shorter hinge-line and smaller ears, as well as in the surface markings.

Formation and localities. In the calcareous shales of the middle Chemung group, Rockville, Hobbieville and Philipsburg, Alleghany county; East Randolph, Cattaraugus county, N. Y., and Mansfield and Sullivan, Tioga county, Pa.

AVICULOPECTEN CANCELLATUS.

Pecten cancellatus, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist. 1843.
Not *Aviculopecten cancellatulus*, McCOY.
Pecten Hallianus,* D'ORBIGNY. Prodrome de Palæontologie, vol. i, p. 87, No. 768. 1847.
Aviculopecten sub-cancellatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, figs. 12, 14–19. Jan., 1883.

HELL small, broadly ovate, oblique; height a little greater than the length; anterior lateral margin full and rounded; posterior lateral margin, below the ears, gently curving. Right valve regularly convex, sloping somewhat abruptly to the posterior ear. Hinge-line straight, equal to two-thirds the length of the shell. Beaks, anterior to the middle of the hinge-line, well-defined, obtuse. Posterior ear small, undefined, the lateral margin concave, not projecting. Anterior ear marked by a deep sinus, with a sulcus extending to the beak; lateral margin rounded.

Test marked by fine, regular, rounded, radiating lines, crossed by regular, sharp, concentric striæ, producing an evenly cancellate surface. The posterior ear is marked by the concentric striæ with obscure radiating lines; the anterior ear is rugose from the prominence of from four to six strong rays.

The original of this species is 20 mm. in height, 19 mm. in longitudinal diameter, and the length of hinge-line 12 mm.

This species is distinguished from *A. duplicatus* and *A. rugæstria-us* by the less rugose surface, smaller size and different outline. The orm of the ears and byssal sinus is very similar to *A. duplicatus*, but iffers in the regular reticulate surface; that species is also a comaratively longer shell. It is in shape more like *A. rugæstriatus*.

Formation and localities. In the middle members of the Chemung roup, at Philipsburg and Rockville, Alleghany county; Conewango, attaraugus county, and near Westfield, Chautauqua county, N. Y.

AVICULOPECTEN ÆQUILATERALIS.

Aviculopecten æquilateralis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

HELL of medium size, transversely ovate, erect, equilateral; height equal to the length; lateral and basal margins regularly rounded; upper anterior and posterior margins extending in nearly a straight line to the beak. Left valve slightly convex; greatest convexity on the umbo. Hinge-line straight, nearly two-thirds the length of the shell, situated centrally. Beak well-defined, situated near the center of the hinge-line. Ears sub-equal, triangular, defined from the umbo by a sinus in the margin, with a sulcus extending to the beak; margins slightly convex; extremities rounded.

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* This name was proposed by d'Orbigny as a substitute for *Pecten cancellatus*, name pre-occupied by Phillips for an Oolitic fossil. The latter is probably a ue Pecten, and there seems to me no sufficient reason why the original name ay not be retained. *Avicula cancellata*, Phillips, Palæozoic Fossils, is probably ot an Aviculopecten.

Test ornamented with about sixty regular, straight, alternating rays, crossed by fine irregular striæ of growth. The rays are present on the ears, and are more numerous on the anterior ear.

The specimen described has a length and height of about 38 mm., and hinge-line of 22 mm.

This species is distinguished by its erect equilateral form, sub-equal ears, and the strong, regularly alternating radii.

Formation and locality. In the upper beds of the Chemung group at Alleghany Sulphur Springs, Warren county, Pa.

AVICULOPECTEN ITYS.

Aviculopecten Itys, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, fig. 13. Jan., 1883.

SHELL small, broadly ovate; length nearly equal to the height, slightly oblique; margins regularly rounded, nearly equilateral. Right valve depressed-convex. Left valve not known. Hinge-line straight, sub-central, having an extent of a little more than one-half the greatest length of the shell. Beak acute, directed slightly forward. Posterior umbonal slope making a greater angle with the hinge-line than the anterior. Umbo subtending a right angle. Ears nearly equal. Anterior ear the larger, obtuse at the extremity, marked by several strong radii, separated from the umbonal region by a strong sulcus. Posterior ear narrow, triangular, margin concave, separated by a distinct sinus from the body of the shell, with no rays of ornamentation; obtuse-angular. Byssal sinus well-defined.

Surface marked by sub-angular, rounded radii, which are regularly increased in size with the growth of the shell, but rarely increased in number by implantation; concentrically marked by fine, regular, thread-like striæ of growth.

The specimen described has a length of 25 mm., height 27 mm., hinge-line 13 mm.

This species is less oblique than *A. Idas*, the hinge-line shorter, radii not present on the posterior ear, surface markings coarser and rays increasing more rapidly in size though fewer in number. In *A. cancellatus* (= *A.* [*Pecten*] *Hallianus*, d'Orbigny), the valve is more convex, beak more obtuse, and the concentric marking forms a prominent feature.

Formation and locality. In the Chemung group at Conewango, Cattaraugus county, N. Y.

AVICULOPECTEN PLENUS.

Aviculopecten plenus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 24, fig. 3. Jan., 1883.

SHELL sub-orbicular, sub-equilateral; transverse axis nearly vertical to the hinge-line; height one-sixth less than the length, giving a marked fullness to the outline of the sides. Left valve convex, the convexity equal to one-sixth the length of the shell. The point of greatest convexity distant one-third the length from the beak. Right valve not observed. Hinge-line straight, nearly central, the length more than two-thirds the length of the shell. Beak obtuse, situated centrally with regard to the hinge-line, and also to the body of the shell; umbo rounded. Ears sub-equal, triangular. Posterior ear mucronate at the extremity; margin deeply concave. Anterior ear acute at the extremity, and the margins convex; separated from the umbo by an abruptly sloping sulcus extending to the beak.

Surface ornamented with about 130 regular, rounded, close filiform radii, crossed by very fine, sharp, concentric striæ. The surface markings are present on the ears, the radii distinct and stronger than on the adjacent portions of the shell. The rays become more frequent and finer from the basal margin in both directions toward the ears.

The height of the specimen is 25 mm., length 30 mm., hinge-line 21 mm. On the lower margin there are 9 rays in the space of 5 mm.

In form, this species bears considerable resemblance to *A. duplicatus;* but the surface markings are quite different, and the extremities of the hinge-line are more acute in this species. In *A. scabridus* the beak is not so well-defined, the ears usually more extended, and the coarser rugose radii of that species are characteristic. This form resembles some varieties of *A. fasciculatus* in the surface characters, but differs in the obliquity of the shell and form of the ears. It differs from *A. Idas* in the more rotund form, more numerous and elevated rays, and larger ears. The single valve described appears to be well distinguished from all the other species, and possesses characters too remote to be united with any of those described from right valves alone.

Formation and locality. In arenaceous shales of the middle Chemung group, near Elmira, N. Y.

AVICULOPECTEN STRIATUS.

Pecten striatus, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist. 1843.
Aviculopecten striatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 10, figs. 3, 4. Jan., 1883.

SHELL transversely ovate, scarcely oblique, nearly equilateral; width somewhat greater than the length. Hinge-line straight, two-thirds the length of the shell, situated centrally in regard to the body of the shell, not extending as far as the margin. Beak central to the hinge-line, well-defined, arching over the hinge; umbo prominent, the sides subtending a right angle. Ears sub-equal, triangular, defined by the rapid slope of the sides of the umbo. Anterior ear the larger, limited by a broad sinus; margins slightly convex; extremity rounded. Posterior ear acute at the extremity; margins concave.

Test ornamented with fine, rounded, closely arranged, regular radiating striæ, from 12 to 14 in the space of 5 mm. at the pallial margin. Some specimens show a slight flattening of the rays and also fine lines of growth. The ears present the same surface characters.

Ligamental area narrow, well-marked: its width is 5 mm. in a specimen of 20 mm. in height.

The original specimen of this species is 20 mm. in height, 18 mm. in length, and the hinge-line 13 mm. Another specimen is 13 mm. in height, 11 mm. in length, hinge-line 8 mm. The largest specimen found has a height of 22 mm.

This species resembles *A. celsus* more nearly than any other form here described; it differs from that one by its much smaller ears with concave margins, more obtuse umbo, regular, equal striæ, and comparatively shorter form. The two species agree in the non-obliquity of the body of the shell to the hinge-line. This species has a vertical range from the middle to the upper members of the Chemung group, but is not abundant.

Formation and localities. In the Chemung group at Painted Post, Steuben county; Chemung Narrows, Tioga county, N. Y., and in Bradford, Tioga and Warren counties, Pa.

AVICULOPECTEN CELSUS.

Aviculopecten altus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, figs. 29, 30. Jan., 1883.
Not *Aviculopecten altus*, WHITE. Bull. U.S. Geolog. Surv., vol. v, p. 110. 1879.

SHELL small, ovate cuneiform, sub-equilateral, not oblique; height one-fifth greater than the length; pallial margin rounded to near the ears, where the sides of the shell are nearly straight. Right valve convex; the greatest convexity being equal to one-fourth the length of the hinge-line. Left valve not observed. Hinge-line straight, length three-fourths the length of the shell, not extending as far as either lateral margin. Beak acute, straight, extremity pointed, arching over the hinge-line; umbo prominent, subtending an angle of 80°. Ears broad-triangular, large, flat, sub-equal, the margins slightly convex; extremities rectangular; separated from the body of the shell by a moderate sinus, and from the sides of the umbo by a sulcus; the byssal sinus is deep and rounded.

Test marked by fine, alternating, filiform radiating striæ, which are absent on the ears, except as two or three alternating undulations. Fine lines of growth mark the test and extend over the ears. Ligamental area linear and marked by an inflection of the hinge-margin.

The specimen has a height of 15 mm. and a length of 13 mm., hinge-line 10 mm. About 13 rays occupy the space of 5 mm., measured near the basal margin.

This form may be distinguished by its equilateral proportions, acute straight apex, the non-obliquity of the transverse axis to the hinge-line, the broad, triangular ears and the alternating surface striæ. These characters separate it from *A. striatus*, to which it is most nearly allied.

Formation and locality. In sandstone of the conglomerate, associated with the upper Chemung group, at Salamanca, Cattaraugus county, N. Y.

AVICULOPECTEN PATULUS.

Aviculopecten patulus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 32, 33. Jan., 1883.

SHELL large, longitudinally broadly elliptical; height about five-sixths as great as the length. The axis of greatest height is at right angles to the hinge, and the line of greatest length is parallel to the hinge and across the middle of the shell. Basal margin convex, somewhat flattened in the middle. Lateral margins very full, and curving rapidly to the ears. Valves convex, the convexity equal to one-fourth the length of the hinge-line. The right and left valves do not differ conspicuously in character, so far as observed. Hinge-line apparently straight, equaling nearly two-thirds the length of the shell, central, not extending as far as either lateral margin. Beaks obtuse, rounded; umbo prominent, straight, central, well-defined by its gibbous form and the rapid slope of the sides. Umbonal angle 110° Ears broad-triangular, sub-equal, separated from the body of the shell by a broad, deep sinus; margins concave below, becoming convex above the middle; extremities rounded.

Test ornamented by regular, sharp radii, with broader concave interspaces, and some finer radii, crossed by irregular crenulating lines of growth. Near the basal margin of a large specimen, there are five of these rays in the space of 10 mm. A smaller specimen has eleven rays in the same space.

The measurements of one individual are: height 55 mm., length 69 mm., hinge-line 41 mm.; of another specimen, height 26 mm., and length 30 mm.

This species nearly resembles in form *A. ellipticus*, and differs by its sharp, crenulated radii, while that species is marked by strong, rounded, continuous plications; and the hinge-line is comparatively somewhat longer. These two forms differ from others in their broad longitudinally elliptical outlines, and the amplitude of the umbones.

Formation and localities. In conglomerate and sandstone, associated with the Upper Chemung group, at Rock City, near Salamanca, Cattaraugus county, N. Y.

AVICULOPECTEN ELLIPTICUS.

Aviculopecten ellipticus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, fig. 31. Jan., 1883.

SHELL large, longitudinally broadly elliptical, equilateral, not oblique; height equal to about four-fifths of the length; margins regularly convex and rapidly curving to the beak. Left valve capacious, convex. Right valve not observed. Hinge-line straight, central, length equal to about one-half the length of the shell. Beak straight, central, obtuse, rounded; umbonal angle about 110°. Ears subequal, broad-triangular, flat; margins slightly convex; extremities rectangular, defined by a gentle sinus, which is deeper below the anterior ear.

Test marked by about 35 strong, rounded, radiating continuous plications which are wider than the interspaces. These radii are absent on the ears. The striæ of growth are irregular and mark the entire surface of the shell.

A large specimen has a height of 53 mm., length 66 mm., hinge-line 34 mm.

This species differs from *A. patulus* in its shorter hinge-line, and the strong, rounded, radiating plications.

Formation and locality. In the sandstone of the upper part of the Chemung group at Meadville, Crawford county, Pa.

AVICULOPECTEN DOLABRIFORMIS.

Pecten? dolabriformis, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 265. 1843.

Aviculopecten dolabriformis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, fig. 21. Jan., 1883.

SHELL small, sub-orbicular, slightly oblique; height nearly equal to the length; margins regularly rounded, becoming more inflated and convex posteriorly. Right valve moderately convex. Left valve unknown. Hinge-line straight, central, more than two-thirds the length of the shell. Beak central, straight, obtuse, rounded, not rising above the hinge-line; umbo well defined by the rapid slope of the sides and the flatness of the ears. Ears triangular, flat; margins slightly concave; extremities obtuse-angular. Posterior ear of the right valve about one-third larger than the anterior. Byssal sinus not marked.

Test cancellate, marked by fine radii and concentric striæ, which characters are also preserved on the ears.

A right valve has a height of 11 mm., length 12 mm., and hinge-line 8 mm.

This small species somewhat resembles *A. squama* in the form of the body and surface markings, but the beak is less acute and the anterior ear comparatively smaller, without distinct sinus.

Formation and locality. In the arenaceous shales of the Chemung group at Philipsburg, Alleghany county, N. Y.

AVICULOPECTEN SQUAMA.

Aviculopecten squama, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, fig. 20. Jan., 1883.

SHELL transversely broad-elliptical, slightly oblique; height about nine-tenths of the length. Right valve moderately convex. Left valve not known. Hinge-line straight; length two-thirds the length of the shell, extending in front as far as the anterior margin of the valve. Beak rounded, not rising above the hinge-line, situated posterior to the center; umbonal angle 90°. Posterior ear small, triangular, narrow, with concave margin; not strongly defined; extremity angular. Anterior ear large, convex, broad-triangular extremity obtuse; margin convex; separated from the body by a deep rounded sinus, and from the sides of the umbo by a distinct sulcus.

Test marked by very fine radiating striæ and irregular lines of growth. These surface characters extend also over the ears.

The specimen described is 11 mm. in height, 12.5 mm. in length, and hinge-line 8 mm.

This species differs from *A. dolabriformis* in its more acute beak, absence of regular concentric striæ, and much larger anterior ear.

Formation and locality. In the Chemung group at Philipsburg, Alleghany county, N. Y.

AVICULOPECTEN CONVEXUS.

Pecten? convexus, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 265. 1843.
Aviculopecten convexus, HALL. Pal. N. Y., vol. v, pt. 1 Plates and Explanations: Pl. 7, figs. 22, 23. Jan., 1883.

SHELL small, sub-orbicular, not oblique; height somewhat greater than the length; margins regularly rounded. Left valve very convex; convexity equal to about one-third the length of the shell. Right valve not known. Hinge-line straight, central, length three-fifths the length of the shell. Beak prominent, straight, central, rounded, arching over the hinge-line; the sides of the umbo subtend a right angle. Ears broad-triangular, extremities obtuse-angular. Posterior ear of left valve smaller than the anterior, defined by the abrupt slope of the umbo; margin slightly concave. Anterior ear convex; margin straight; separated from the umbo by a very deep and narrow sulcus. Byssal sinus small.

Test marked by fine, irregular, radiating striæ and finer regular concentric lines; the same surface characters are continued over the ears.

The original of this species has a height of 12.5 mm., length 12 mm., and hinge-line 8 mm.

The remarkable convexity of the left valve distinguishes this species from all the other forms here described. Its orbicular outline, prominent beak and deep anterior sulcus are also characteristic. In general appearance the body of the shell resembles some forms of Athyris and Meristina among the Brachiopods, but its pectinoid character is well marked.

Formation and locality. In the shales of the Chemung group at Rockville, Alleghany county, N. Y.

AVICULOPECTEN SIGNATUS.

Avicula ? signata, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 265. 1843.
Aviculopecten signatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 7, fig. 24. Jan., 1883.

SHELL small, obliquely sub-elliptical, the longest diameter making an angle of about 45° with the hinge-line; height and length nearly equal. Left valve depressed, slightly convex. Right valve unknown. Hinge-line straight, length more than two-thirds the length of the shell, extending in front as far as the anterior margin. Beak very obtuse, rounded, depressed, directed forward, situated near the center of the hinge. Ears triangular, sub-equal, flat. Anterior ear separated from the umbo by a sulcus; margin convex; extremity rounded. Byssal sinus moderately deep. Posterior ear not well defined; margin slightly concave; extremity obtuse-angular.

Test conspicuously marked by fine, regular, lamellose concentric lines, and a few irregular, radiating, indented striæ.

The original of this species is 11 mm. in length and height; the hinge-line 8 mm.

This species is distinguished by the oblique, elliptical outline of the body of the shell, the depressed, obtuse beak, and the well-defined concentric striæ.

Formation and locality. In the Chemung group at Rockville, Alleghany county, N. Y.

AVICULOPECTEN CAROLI.

Aviculopecten Caroli, WINCHELL. Proceedings Acad. Nat. Sci., Phila. 1863.
Aviculopecten Caroli (WINCHELL), HALL. Pal. N Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, fig. 5. Jan., 1883.

SHELL small, sub-circular, not oblique; length and height equal; basal margin regularly rounded. Left valve convex, the convexity equal to about one-sixth of the longitudinal diameter. Right valve unknown. Hinge-line straight, length three-fourths of the diameter, extending nearly to the anterior margin of the shell. Beak obtuse, prominent, central, rising above the hinge. Ears triangular, nearly equal, separated from the umbo by distinct sulci. Anterior ear with slightly convex margin; extremity rounded. Byssal sinus deep. Margin of posterior ear concave; extremity abruptly mucronate.

The test (as preserved on a partial cast of the interior) is marked by about 45 regular alternating, rounded rays with equal interspaces. The lines of growth are fine and obscure on the specimen. The ears are marked by from five to eight rays similar to those in the body of the shell. In the original description of this species mention is made of small, spinose processes from the concentric striæ; these do not exist in this specimen, which is a partial cast of the interior. The ligamental area is a linear furrow along the hinge-line; cartilage pit small, situated under the beak.

The left valve described has a height of 17 mm., and an equal length; hinge-line 13 mm.

This species is distinguished from *A. striatus* by its more circular form, obtuse beak, and stronger radii. Compared with *A. celsus*, the ears are smaller, and the height comparatively much less.

Formation and locality. In the yellow sandstone of the Waverly group at Newark, Ohio.

AVICULOPECTEN (CRENIPECTEN ?) INCULTUS.

Aviculopecten (*Crenipecten ?*) *incultus*, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, fig. 3. Jan., 1883.

SHELL small, longitudinally very broad-elliptical, nearly circular; not oblique to the hinge-line, sub-equilateral; height somewhat less than the longitudinal diameter; basal margin regularly rounded. Right valve depressed-convex. Left valve unknown. Hinge-line straight, central, length one-half the length of the shell. Beak obtuse, rounded, not rising above the hinge-line; sides of the umbo straight. Ears small, sub-equal, narrow-triangular, separated from the sides of the umbo by sulci. Margin of posterior ear concave; extremity obtusely angular. Anterior ear defined by a deep, angular byssal sinus; margin convex; extremity rounded.

The external markings of the test are not preserved. The cast of the interior is nearly smooth. Pallial line faintly impressed. At each side of the umbo there is a shallow, undefined impression, nearly parallel to the margin, extending to about the middle of the length of the shell.

A specimen of the right valve has a height of 15 mm., length 17 mm., hinge-line 8 mm.

This species approaches very nearly several forms referred to CRENIPECTEN. More perfect material may show the hinge to be crenulate, which character would exclude it from AVICULOPECTEN.

Formation and locality. In conglomerate, referred to the Upper Chemung group, near Olean, Cattaraugus county, N. Y.

AVICULOPECTEN (PTERINOPECTEN ?) INVALIDUS.

Pterinopecten invalidus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, fig. 18. Jan., 1883.

SHELL small, rhomboidal; length and height nearly equal; moderately oblique; margins regularly rounded, full behind; the greatest posterior extension is below the middle. Left valve depressed-convex. Right valve unknown. Hinge-line nearly straight, length a little more than the length of the valve, and extending anteriorly. Beak obtuse, rounded, situated just anterior to the center of the hinge-line, directed slightly forward, depressed. Umbonal region moderately prominent, subtending an angle a little less than 90°. Ears triangular, flat, extremities acute. Anterior ear smaller, defined by a sulcus; margin nearly straight. Posterior ear with the margin concave, extremity acuminate; having no strong radiating striæ.

Test, as indicated in an exfoliated specimen, marked by a few fine radiating striæ, with wider interspaces which are marked by finer radii. Anterior ear showing the same characters. Posterior ear free from rays. Fine concentric striæ cross the rays, and stronger concentric wrinkles interrupt them and produce a slight crenulation of the radii.

The specimen is 10.5 mm. in length, 10 mm. in height, with hinge-line a little more than 11 mm.

This species resembles in form the young of *Pterinopecten dignatus*, but differs in the finer radiating lines on the body of the shell, the concave margin, and absence of rays on the posterior ear.

Formation and locality. In the black Marcellus shale at Cherry Valley, Otsego county, N. Y.

AVICULOPECTEN (PTERINOPECTEN ?) TERMINALIS.

Pterinopecten terminalis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, fig. 3. Jan., 1883.

SHELL small, rhomboidal; body of the shell obliquely ovate; length a little greater than the height; margins regularly rounded, somewhat extended behind. Left valve very convex. Right valve unknown. Hinge-line straight, central, equal to the length of the shell. Beak acute, prominent, directed a little forward, arching over the hinge-line. Umbo elevated, subtending a right angle. Ears triangular; margins concave; extremities acute. Posterior ear larger, undefined. Anterior ear limited by a shallow sulcus. Byssal sinus moderate.

Test thin, marked by fine sharp radii, with wider interspaces, which show one, two or three finer rays, crossed by fine crenulating lines of growth. The same characters of marking extend over the ears.

The specimen is 14 mm. in length, 12 mm. in height, with hinge-line 15 mm.

This species, in surface markings, bears a slight resemblance to a young individual of *Aviculopecten princeps*; but the undefined ears and proportionally longer hinge-line distinguish it.

Formation and locality. In the upper layers of the Corniferous limestone, Young's farm, Williamsville, Erie county, N. Y.

SECTION *b*.

AVICULOPECTEN IGNOTUS.

Aviculopecten ignotus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, fig. 2. Jan., 1883.

SHELL of medium size, transversely and obliquely sub-ovate; height about five-sixths of the length; margins regularly rounded, full on the anterior and posterior sides. Left valve slightly convex, nearly flat. Right valve unknown. Hinge-line straight, central, length nearly equal to the height of the valve. Beak obtuse, rounded, low, directed toward the anterior. Posterior ear large, broad-triangular, separated from the side of the umbo by a wide shallow sulcus; margin slightly concave; extremity obtuse-angled. Anterior ear less than one-half the width of the posterior, narrow-triangular, separated from the umbo by a deep byssal sinus and a distinct sulcus, extending to the apex of the beak; margin convex; extremity rounded.

Test thin, about .5 m. in thickness; marked with about twenty-five irregular, rounded radii, which are crossed by very fine concentric striæ, and occasionally interrupted by varices of growth. The rays are conspicuous over the center of the valve, becoming obscure toward the margins. The ears show the concentric striæ only.

A specimen of the left valve measures 25 mm. in height, 29 mm. in length, and the hinge-line 21 mm.

This species in general expression resembles *A. tenuis*, but is distinct in its smaller anterior ear, more obtuse beak, orbicular form, and more irregular and stronger rays. Their geological positions are widely separated.

Formation and locality. In soft shaly beds of the Corniferous limestone, which constitute the upper portion of the group at Lapham's mill, near Victor, Ontario county, N. Y.

AVICULOPECTEN INSIGNIS.

Aviculopecten insignis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, fig. 8; pl. 3, fig. 13. Jan., 1883.

SHELL less than medium size, sub-rhomboidal, moderately oblique; about one-third longer than high; basal margins rounded; anterior and posterior margins obtusely angular or abruptly rounded, and extending along the cardinal slopes in a direct line to the beak. Both valves are quite convex; right valve somewhat the less convex. Hinge-line straight, nearly equal to the length of the shell. Beak obtuse-angular, prominent, directed forward, nearly central. Umbonal region ample, the sides subtending an obtuse angle, and sloping more abruptly to the anterior than to the posterior margin. Ears sub-equal, triangular. Anterior ear, concave or flat, defined by a distinct sulcus; margin deeply concave; extremity acuminate. Byssal sinus deep and well-marked. Posterior ear flattened, defined by the absence of the stronger radii; extremity slightly acute; margin concave.

Test thin, marked by strong radiating costæ, which, in the left valve, are abruptly elevated and increase by interstitial addition; crossed by infrequent elevated thread-like concentric crenulating striæ, which sometimes give a nodose character to the radii, and by finer lines of growth. The right valve is marked by rounded rays arranged in pairs, bifurcating on the umbo, crossed by fine concentric lines of growth. The radiating striæ are obscure on the ears, being more strongly marked on the anterior one.

The largest specimen has a length of 27 mm., height 20 mm., hinge-line 23 mm. A smaller specimen of 18 mm. in length has a hinge-line of precisely the same length.

This species is less oblique, and the extremity of the posterior ear is less mucronate than in *A. bellus* and *A. ornatus*. The surface markings are very similar to the former, but quite distinct from the latter.

Formations and localities. In limestone above the Marcellus shales at Stafford, Genesee county; in the softer shales of the Hamilton group at Moscow, Livingston county, and at Hamburgh, Erie county N. Y.

AVICULOPECTEN BELLUS.

Avicula bella, CONRAD. Ann. Geolog. Rep., N. Y., p. 54. 1841.
Aviculopecten bellus (CONRAD), HALL. Pal., N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 2, figs. 5, 6, 9. Jan., 1883.

SHELL small, longitudinally sub-elliptical; height equal to two-thirds or three-fourths of the length; margins regularly rounded. Valves moderately convex; the right valve somewhat shallower than the left; very similar in form and ornamentation. Hinge-line straight, the length a little greater than the longitudinal diameter of the shell, nearly central, extending equally between the posterior and anterior margins. Beaks obtuse-angled, directed forward, placed anterior to the middle of the valve; sides of the umbo carinate, and descending abruptly to the ears. Posterior ear flat or concave, narrow-triangular, well-defined by the carinate sides of the umbo, and by the absence of the strong surface radii; margin concave; extremity acute, mucronate. Anterior ear about two-thirds as long as the posterior one, triangular, convex; defined by a deep sulcus, and the angular cardinal slope of the umbo; margins of the ears in the left valve straight or concave; in the right valve, convex; extremities acute-angled. In the left valve the byssal sinus is broad and rounded; in the right valve it is a deep, angular notch.

Test of the left valve marked by from 40 to 50 regular, continuous, thread-like rays, alternating in fours, with three degrees of prominence, crossed and crenulated by fine, regular, concentric striæ. The surface of the right valve is nearly the reverse of this, having broad, flattened rays, arranged in pairs, regularly bifurcating, with narrow concave interspaces which correspond to the rays of the opposite valve. The posterior ears show several delicate rays extending from the apex of the beak over their upper portion.

A specimen preserving both valves has a height of 14 mm., length 19 mm., and hinge-line 20 mm. A right valve has a height of 14 mm., length 22 mm. A left valve has a height of 12 mm., length 16 mm., hinge-line 17 mm.

This species in appearance resembles *A. ornatus*, and differs in its longitudinally narrower outline, more obtuse beak, the numerous rays, and the absence of strong, lamellose, concentric fimbriæ. The two forms are of a group resembling several species in a parallel group of the genus ACTINOPTERIA, which are remarkable as possessing an aviculoid character (when compared with some recent species of *Avicula*); in the strong rays, the deep anterior sulcus and byssal sinus separating the anterior ears from the body of the shell.

Formation and localities. In the soft shales of the Hamilton group at Tinker's Falls, Onondaga county; Bellona, Yates county, and near Norton's Landing, Cayuga lake, N. Y.

AVICULOPECTEN ORNATUS.

Aviculopecten ornatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 2, figs. 7, 8; pl. 3, fig. 14. Jan., 1883.

SHELL small, longitudinally oblique-ovate, sub-rhomboidal; length and width in the proportion of three to four; margins regularly rounded. Valves depressed-convex; left valve somewhat more convex than the right, and a little larger. Hinge-line straight, slightly less than the length of the shell, central with regard to the body of the shell. Beak obtuse-angular, directed forward, situated a little anterior to the middle. Ears sub-equal. Posterior one the larger, triangular flat or concave, defined by the abrupt post cardinal slope of the umbo; extremity acute; margin concave. Anterior ear defined by a deep sulcus; byssal sinus deep, most strongly marked in the right valve.

Test of the left valve ornamented by about 25 strong, sharp, elevated rays, and wide interspaces which are marked with a smaller ray; crossed by undulating concentric striæ which are curved backward between the stronger rays, producing arched fimbriæ. The right valve shows the radiating striæ originating near the umbo, which is smooth, and increasing by a double bifurcation, giving them a fasciculate appearance; they are crossed by undulating, concentric striæ. The ears are marked by strong, radiating lines and fine, concentric striæ.

The length of the largest specimen is 18 mm., height nearly 15 mm., and hinge-line about 17 mm.

This species, in form and general appearance, is very similar to *A. bellus;* it differs conspicuously in the ornamentation, with proportionally shorter posterior ear. Both species show the smooth area on the umbo of the right valve; a character not observed in any other species here described.

Formation and locality. In the Hamilton group; shores of Canandaigua lake, Ontario county, N. Y.

AVICULOPECTEN MUCRONATUS.

Aviculopecten mucronatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 3, fig. 15. Jan., 1883.

SHELL small, rotund-ovate, slightly oblique; length a little greater than the height; basal and anterior margins regularly rounded; posterior margin full, abruptly sloping to the beak. Left valve strongly convex. Right valve not observed. Hinge-line straight, equal to the greatest length of the shell, extended anteriorly. Beak obtuse-angular, directed forward, nearly central. Umbo deep, sides subtending an obtuse angle, sloping to the ears. Ears sub-equal. Anterior ear narrow-triangular, elongate, acuminate, defined by the deep byssal sinus and marked sulcus; margin concave. Posterior ear wider, limited by an undefined sulcus; margin concave; extremity acute.

Test ornamented by rounded radii, which bifurcate toward the margin; crossed by prominent, regular, concentric striæ. Hinge-area simple.

The specimen has a length of 16 mm., height 15 mm., hinge-line 16 mm.

This species differs from *A. insignis*, *A. bellus* and *A. ornatus* in the following characters: the anterior ear is narrower, the outline of the shell is less oblique, and the form is more rotund.

Formation and locality. In calcareous shales of the Hamilton group at Dresden, Yates county, N. Y.

AVICULOPECTEN TENUIS.

Aviculopecten tenuis, HALL. Pal. N. Y.. vol. v, pt. 1. Plates and Explanations: Pl. 7, figs. 27, 28. Jan., 1883.

SHELL small to medium size, sub-orbicular, transverse axis oblique; length and height equal; margins regularly rounded, somewhat extended behind. Left valve slightly convex, nearly flat. Right valve unknown. Hinge-line straight, nearly central; length five-sixths of the longitudinal diameter. Beak directed forward, not rising above nor extending beyond the hinge, anterior to the center of the hinge-line and of the valve. Umbonal angle 90°. Ears large, broad-triangular, unequal, separated from the sides of the umbo by a broad; shallow sulcus. Anterior ear about one-half the size of the posterior, flat, margin convex; extremity obtuse-angular. Byssal sinus broad and comparatively shallow. Posterior ear marked by a low, convex undulation, adjacent and parallel to the sulcus; margin straight or slightly concave; extremity rectangular, pointed, more obtuse in mature specimens.

Test marked by about twenty-five strong, regular radii, with broader concave interspaces, and also, in well-preserved specimens, smaller intermediate rays. The specimens described are casts of the interior, and show but faint traces of concentric lines of growth. The ears are mostly free from surface markings. Pallial line impressed, continuous, situated about one-half the distance between the apex of the beak and the pallial margin of the shell. Muscular impression elliptical, within the concavity of the valves adjacent to the sulcus of the posterior ear. Hinge-ligament without marked characters.

The largest specimen has a height of 29 mm., length 30 mm., and hinge-line about 23 mm. A smaller individual is 23 mm. in height, 23.5 mm. in longitudinal diameter, and hinge-line measuring 19 mm.

This species resembles in some respects *A. ignotus*, and is distinguished by its transverse form, greater obliquity, larger anterior ear in the left valve, rectangular beak, and more regularly alternating rays. Both of these forms are remarkable for the very slight convexity of the left valve.

Formation and localities. In calcareous sandstone of the Upper Chemung group, Randolph and Salamanca, Cattaraugus county, N. Y.

LYRIOPECTEN, HALL.

LYRIOPECTEN PARALLELODONTUS.

Lyriopecten parallelodontus, HALL. MS. for Pal. N. Y., vol. v. 1877.
" " " S. A. MILLER. Cat. Amer. Pal. Foss, Cincinnati, 1877.
Lyriopecten parallelodontus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 4, figs. 1, 2. Jan., 1883.

SHELL of medium size, sub-orbicular, not oblique; height somewhat less than the longitudinal diameter; margins regularly rounded. Right valve moderately convex. Left valve unknown. Hinge-line straight; anterior portion not preserved in the specimen; from the beak to the extremity of the posterior ear its length is one-half the longitudinal diameter of the shell. Beak obtuse, rounded, slightly oblique, anterior to the center of the valve; umbonal region ample. Posterior ear large, broad-triangular, flat; margin straight or slightly concave; extremity rectangular. Anterior ear not preserved.

Test thin, marked by about 90 regular, alternating, rounded radii, with concave interspaces, and crossed by fine, elevated, sharp, cancellating striæ; these are crowded over the posterior ear, and the rays are there more numerous and less regularly alternating. The mould of the interior preserves, around the margin, traces of the stronger rays, and shows a moderately impressed pallial line, with apparently an ovate, muscular impression near the umbonal region. Cartilage-pit small, deeply indented. Ligamental area narrow, marked by two or three slender, parallel grooves, extending to the posterior extremity ; and one or two shorter accessory grooves, extending for a short distance from the cartilage-pit, and parallel to the longer folds.

The specimen consists of the exterior and interior impression of a right valve; it is 38 mm. in height, 43 mm. in length, and the incomplete hinge-line measures 20 mm. from the beak to the end of the posterior ear.

This species differs from *L. orbiculatus* in its comparatively greater length, the convexity of the right valve, and the regular alternation of the rays. It is remarkable as the only pectenoid form yet observed in the Schoharie grit, while similar forms are numerous in the Upper Helderberg limestone.

Formation and locality. In the Schoharie grit, Albany county, N. Y.

LYRIOPECTEN DARDANUS.

Lyriopecten Dardanus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, fig. 5. Jan., 1883.

SHELL of medium size, orbicular, transverse axis not oblique; height a little less than the length; margin regularly rounded. Left valve moderately convex. Right valve unknown. Hinge-line straight, length nearly equal to the transverse diameter of the valve, extending as far as the posterior margin. Beak obtuse, rounded, straight, anterior to the middle of the hinge-line and to the center of the longitudinal diameter. Anterior ear small, narrow-triangular, flat, separated from the umbo by a broad, undefined sulcus; margin slightly convex above the sinus; extremity rectangular, rounded. Posterior ear large, broad-triangular, flat; margin straight or slightly concave, rectangular to the hinge-line ; extremity mucronate.

Test marked by about forty strong, rounded, continuous rays with wider concave or flat interspaces, and sometimes a smaller intermediate ray; crossed by sharp, elevated concentric striæ. The rays are fine and little elevated on the ears, while the concentric striæ are conspicuous. Interior characters not observed, except an indication of a well-defined ligamental area.

The specimen is 45 mm. in height, 48 mm. in length, and the hinge-line 43 mm.

This species resembles *L. parallelodontus*, but differs in the comparatively larger and more extended posterior ear and fewer and stronger rays, without regular alternation of size. *L. orbiculatus* is more elongate, with more numerous radii and less defined anterior ear.

Formation and locality. In the limestone of the Upper Helderberg group, Le Roy, Genesee county, N. Y.

LYRIOPECTEN ORBICULATUS.

Avicula orbiculata, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 202. 1843.
Lyriopecten orbiculatus, HALL. MS., vol. v, pt. 1. 1877.
“ “ “ S. A. MILLER, Cat. Amer. Pal. Foss. Cincinnati, 1877.
“ “ “ Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 4, figs. 3–8. Jan., 1883.
Not *Aviculopecten orbicularis*, McCOY. Carb. Foss. of Ireland. 1844.
“ “ *orbiculatus*, “ “ “ “ “

SHELL large, orbiculate, becoming wider and oblique with age; length and height equal in small and medium individuals; in large specimens the height is sometimes one-ninth greater than the longitudinal diameter; basal and lateral margins full and regularly rounded. Left valve moderately convex; umbonal region ample. Right valve concave, flat or slightly convex over the umbonal region. Hinge-line straight, central; length in young shells equal to four-fifths or five-sixths of the longitudinal diameter; and in large specimens the length is sometimes not more than one-half the length of the valve. Beak obtuse, slightly oblique to the hinge, not rising above it, situated anterior to the middle of the hinge-line, and to the center of the valve. Anterior ear of left valve, in small shells, comparatively large, triangular, limits not strongly defined; margin straight or slightly concave; extremity acute-angular; in older shells comparatively narrow, with an obtuse-angular extremity. Anterior ear of the right valve defined by a sulcus, extending to the extremity of the beak; margin convex; extremity rounded. Byssal sinus scarcely indicated on the left valve, forming a deep, angular notch in the right valve. Posterior ear large, broad-triangular; length about two-thirds of the hinge-line; margin concave; extremity acute or right-angled in small specimens, obtuse in larger individuals; limits not defined.

Test thin, thickness nearly 3 mm., ornamented by about 80 rounded radii, with broader concave interspaces, crossed by regular, sharp, elevated, continuous, concentric, foliate expansions of the test, reaching an elevation of about .6 m. above the general surface. Usually the test shows only the strong rays, with occasionally a reticulation where the concentric folds are only partially preserved. The figure cited represents also the internal mould where the test has been wholly removed. Ligamental area, in young shells, represented by a slight inflection of the margin of the hinge with a very small longitudinal groove. In more mature specimens this area is wider, the number and strength of the grooves increasing, until they occupy a continuous space between the extremities of the hinge-line, slightly bending outward at the beak; the inner ridges and grooves do not extend the whole length of the area. Cartilage-pit and muscular impressions not observed.

The original specimen of this species is 38 mm. high, 39 mm. long, hinge-line about 30 mm. Another more nearly entire specimen is 65 mm. high, 67 mm. long, hinge-line 37 mm. The largest specimen observed shows a height of 75 mm., with length nearly equal, and hinge-line 42 mm. In this specimen the longest diameter is 85 mm., measured from a point on the upper anterior margin to the lowerposterior margin.

This species is distinguished by its form and surface markings. The characters of surface distinguish it from *L. Priamus* and *L. macrodentus*, though in form it bears some resemblance to the former; and in the ligamental grooves it is similar to the latter. *Pterinopecten suborbicularis*, in some of the younger specimens, resembles this species in general aspect; but none of that species have shown a broad, ligamental area, and the ears continue to increase with the growth of the shell.

Formation and localities. In shales of the Hamilton group at Menteth's Point, Canandaigua lake, Ontario county; Moscow, Geneseo and York, Livingston county; and in the shale and Encrinal limestone, along Lake Erie shore, Eighteen-mile creek, Erie county, N. Y.

LYRIOPECTEN INTERRADIATUS.

Lyriopecten interradiatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 2, figs. 1–4. Jan., 1883.

SHELL large, longitudinally very broadly elliptical; transverse axis somewhat oblique to the hinge-line; height about one-ninth less than the length; margins full and regularly rounded. Valves about equal in dimensions. Left valve depressed, moderately convex. Right valve flat, or slightly concave below, becoming convex toward the beak. Hinge-line straight, central to the body of the shell; length less than two-thirds the longitudinal diameter of the shell. Beak of left valve obtuse, not prominent, directed forward, situated about one-third the length of the hinge-line from the extremity of the anterior ear. In the right valve the umbo is often flat, and the angle subtended by its sides is acute, caused by the deep byssal sinus. Posterior ears narrow-triangular, distinguished from the gradually sloping sides of the umbo by their flatness and finer markings; margins concave; extremities mucronate. Anterior ear of the left valve smaller, triangular; margins concave; extremity rectangular. Anterior ear of the right valve convex, triangular, truncated at the extremity; separated from the umbo by a deep angular sulcus, and a broad longitudinal semi-elliptical byssal sinus, which forms an indentation in the lateral outline of the body of the shell.

Test of the left valve marked by about 40 strong rounded rays with smaller intermediate implanted rays, crossed by fine, regular, elevated sharp lines of growth, which at intervals are raised into lamellæ, and appear in the cast as strong transverse ridges crossing the radii. The furrows between the radii are narrower than the rays. The regular alternation of the radiating lines where seen is a very conspicuous feature. The right valve is marked by more numerous and subdued rays, and their alternation is somewhat obscure. The ears show fine radiating lines and stronger and more crowded concentric striæ.

A medium-sized individual has a height of 47 mm., longitudinal diameter 54 mm., hinge-line 32 mm. A smaller specimen measures in height 35 mm., length 38 mm., hinge-line 24 mm. The largest specimen (imperfect) shows a height of 74 mm., and a length of 88 mm.

In outline and general aspect this species closely resembles *L. macrodontus*, but differs in the obliquity of the beak, wider anterior ears, and more elevated and numerous rays. It differs from *L. magnificus* in its outline, larger anterior ears, longer hinge-line, and finer radii of the ears.

The specimens mostly preserve both valves in connection. A large specimen occurring in the harder argillaceous sandstone attains nearly the dimensions of *L. cymbalon* but differs conspicuously in the more numerous, strong radii, their gentle curvature toward the anterior side, and the smaller area of surface upon the anterior side of the vertical axis of the valve.

Formation and locality. In the shales of the Hamilton group, Fultonham, Schoharie county, N. Y.

LYRIOPECTEN MACRODONTUS.

Lyriopecten macrodontus, HALL, S. A. MILLER. Cat. Pal. Foss. Cincinnati. 1877.

Lyriopecten macrodontus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 4, fig. 9; pl. 8, figs. 9, 10. Jan., 1883.

SHELL large, sub-circular; in some large specimens becoming transversely broad-ovate, from the posterior extension of the valve; height from one-sixth to one-eighth less than the length; margins regularly rounded, more convex at the posterior lateral margin, and extending in nearly a straight line to the beak. Left valve depressed, moderately convex. Right valve unknown. Hinge-line straight, nearly central, varying in length with the age of the shell. Beak obtuse, rounded, directed slightly toward the anterior, not rising above the hinge. Anterior ear small, about one-third the length of the posterior, triangular, not well-defined; margin straight or slightly concave; extremity obtuse. Posterior ear large, triangular, defined by the absence of the strong radii, and by a shallow, undefined depression reaching to the beak; margin deeply sinuate; extremity acuminate.

Surface marked by from 30 to 40 broad, rounded radii, with smaller intermediate rays, crossed by fine striæ of growth. Some fragments of shell, adhering to the internal mould, have a thickness of one millimeter. Muscular impression large, sub-circular, concentrically striated, situated posterior to, and below the umbonal region. Cartilage-pot very small, triangular beneath the apex of the beak, not extending to the hinge-margin. Ligamental area usually marked by five strong, elevated ridges, which curve outward at the beak diverging from, and partially inclosing the cartilage-pit, and continuing toward the extremities of the ears; the innermost ridges disappear before reaching the extremity of the area.

The largest specimen is 85 mm. high, 98 mm. long, and the hinge-line 50 mm. Another specimen, somewhat different in proportions, is 68 mm. in height, 75 mm. long, with hinge-line of 40 mm.

Compared with *L. magnificus*, this species has greater convexity, less elevated radii, and, in general, a comparatively greater longitudinal diameter. It differs from *L. cymbalon* and *L. tricostatus* in surface ornamentation. This species, described from only the left valve, is nevertheless so distinctly unlike any others here described that it is readily recognized.

Formation and localities. In the coarse beds of the Hamilton group, at Hamilton, Madison county, and Worcester, Otsego county, N. Y.

LYRIOPECTEN CYMBALON.

Lyriopecten cymbalon, HALL. Pal. N. Y., vol. v, pt. 5. Plates and Explanations: Pl. 24, fig. 8. Jan., 1883.

SHELL large, sub-orbicular, not oblique; height a little less than the longitudinal diameter; pallial margin regularly rounded, upper anterior margin more inflated than the posterior, which is truncated toward the beak. Left valve regularly convex; the basal margin slightly inflected, giving the valve an undue convexity. Right valve not known. Hinge-line straight, length a little greater than one-half the longitudinal diameter of the shell, and extending about one-third of its length farther to the posterior than to the anterior margin. Beak obtuse, rounded, straight, central; umbonal region defined by its abrupt antero- and post-cardinal margins, and by its convexity. Anterior ear very small, narrow-triangular; margin concave; extremity obtuse-angular; byssal notch broad and shallow, not conspicuous. Posterior ear large, triangular, marked by a deep sinus; margin convex; extremity angular; length twice as great as the anterior ear.

Test marked by about twelve very strong, continuous, broad, rounded rays, with from one to six smaller ones of variable strength in each of the flat interspaces; crossed by fine, sharp, regular, concentric striæ of growth, which are elevated into lamellar ridges at irregular intervals. The ears and a broad adjacent space on the body of the valve are destitute of rays, but show strong striæ and undulations of growth. The direction and character of the rays in the specimens described have been affected, apparently, by some injury received during the life of the animal, which has also produced a strong varix of growth. Ligamental area 1.5 mm. wide at the beak, whence it diminishes toward the extremities of the hinge-line, marked by several flat, longitudinal striæ. Cartilage-pit broad-triangular, situated under the apex.

The specimen described is 75 mm. in height, 88 mm. in longitudinal diameter, and hinge-line 46 mm. The distance between the centers of two of the large rays at the basal margin is about 17 mm.

The surface markings resemble *L. tricostatus*, but they are stronger, more rugose, and the rays less numerous; also the shell is not oblique, and the beak is more obtuse and rounded. It differs from *L. macrodontus* and *L. magnificus* in its greater convexity, deeper byssal sinus, larger posterior ear, and by its surface characters. This remarkably large and fine species shows conspicuously the diminished anterior ear, a feature also seen in *L. tricostatus*, which is the reverse of many species of recent Pectenidæ, where the anterior ears are developed beyond the posterior; as in *Janira longicauda* (D'ORBIGNY), and *Pecten Tranquebaricus* (GMELIN). This species, although seen in only one valve, is characterized by its peculiar surface markings and outline.

Formation and locality. Hamilton group, from a bowlder found near Elmira, N. Y.

LYRIOPECTEN TRICOSTATUS.

Avicula tricostata, VANUXEM. Geolog. Surv. N. Y.: Report of Third Dist., p. 179, fig. 1. 1843.

Lyriopecten tricostatus (VANUXEM), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 4, fig. 11; pl. 7, fig. 26; pl. 10, figs. 6–12. Jan., 1883.

SHELLS large, transversely and more or less obliquely broad-ovate; height usually less than the length, the proportions varying with the age of the shell; young specimens are longitudinally elliptical; mature specimens are more oblique; while some abnormal forms show a difference in the direction of the transverse diameter of nearly 45°; margins full, rounded anteriorly, extended on the postero-basal side, and thence following a nearly straight line to the beak. Valves similar in general outline. Right valve flat or slightly concave. Left valve moderately convex. Hinge-line straight, central, varying from more than one-half the longitudinal diameter in young specimens, to less than one-half in mature examples. Beak pointed, depressed, directed forward, situated anterior to the middle of the hinge-line, and not extending as far as the margin of the hinge. Umbonal angle 90°. Anterior ear small, triangular, usually less than half the length of the posterior one; margin rounded; extremity obtuse; byssal sinus broad, rounded, indenting the body of the shell, and shortening the anterior ear. In the right valve the notch is deeper and more angular. Posterior ear large, flat, triangular, marked by a distinct sinus which increases with the age of the shell; margin above the sinus straight, convex or concave; extremity angular. In young specimens the ears are subequal, undefined, and without sinus. In older shells the anterior ear becomes diminished, or appears comparatively smaller; while the posterior ear is increased in size.

Surface ornamented by from 20 to 25 strong, rounded, continuous rays, with broad, flat interspaces which show from three to ten smaller radii; and in well-preserved specimens the entire surface of the shell is marked by fine, regular, sharp, elevated, continuous, concentric lines of growth. In the right valve the finer radiating lines are conspicuous, while the others are obscure and more numerous. The ears do not show the stronger rays, but usually preserve the finer radiating and concentric lines, and are marked by regular, concentric undulations, which are not seen on the body of the valves. The thickness of the test is not known.

The hinge-ligament in mature specimens has a width of about 2 mm., and is marked with from four to seven longitudinal, raised lines, or ligamental grooves, diverging from the cartilage-pit, and continuing parallel to the hinge-line ; cartilage-pit small, triangular, placed beneath the beak.

The largest specimen yet seen, of the left valve, is 80 mm. in height, 88 mm. in length, and the hinge-line 35 mm. ; the distance between the strong rays at the basal margin is 11 mm. A specimen of medium size is 62 mm. in height, 72 mm. in length, hinge-line 39 mm. A young individual is 23 mm. in height, 29 mm. in length, and hinge-line 18 mm.

This species somewhat resembles in outline *L. macrodontus*, but differs in the surface markings, and the finer parallel teeth of the ligamental area. It differs from *L. magnificus*, *L. interradiatus*, and *L. cymbalon* in outline ; the surface of the latter species is similar, but more rugose. From *L. Priamus* it differs in form and surface markings. In comparing many specimens a great diversity in form and ornamentation will be observed.

Formation and localities. In the lower and middle Chemung beds at Barker, Broome county; Big Flats, Chemung Narrows, and Elmira, Chemung county, and Franklin, Delaware county, N. Y.

LYRIOPECTEN POLYDORUS.

Lyriopecten Polydorus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations : Pl. 7, fig. 25. Jan., 1883.

SHELL of medium size; transversely very broad-obovate ; height nearly equalling the longitudinal diameter ; pallial margins full, regularly rounded on the posterior side ; and the anterior side of the left valve passing in nearly a straight line to the beak. Left valve depressed, nearly flat. Right valve unknown. Hinge-line straight, length equal to two-thirds the length of the shell, extending posteriorly nearly as far as the posterior margin of the shell. Beak pointed, directed forward, central to the body of the shell, and forward of the middle of the hinge-line, rising a little above it. Umbonal angle more than 90°. Posterior ear narrow-triangular, one-third longer than the anterior, the limits not well-defined, and it appears as an expansion or extension of the posterior side of the umbo; margin concave; extremity mucronate. Anterior ear short-triangular; margin convex; extremity rounded, separated from the umbo by a deep, rounded sulcus, which corresponds to the byssal sinus.

Test ornamented by about 25 irregular, strong, rounded rays, with wider interspaces, marked by two or three smaller lines in each one, and crossed by fine striæ of growth. The surface markings extend over the ears.

The valve described is 28 mm. high, and of about the same length, and the hinge-line 18 mm. The length of the posterior ear is 11 mm., and of the anterior ear 7 mm.

This species bears some resemblance to *L. solox*, but differs in the flatness of the valve and less gibbous umbo. In surface character it is similar to *L. tricostatus*, but has fewer intermediate striæ between the stronger rays, which in that species are more simple and rounded; while in other characteristics they are very unlike.

Formation and locality. In argillo-arenacous slates of the Chemung group near Cassadaga, Chautauqua county, N. Y

LYRIOPECTEN MAGNIFICUS.

Lyriopecten magnificus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 8, fig. 8. Jan., 1883.

SHELL very large, nearly circular; height a little less than the longitudinal diameter; basal and lateral margins regularly rounded. Left valve nearly flat; the greatest convexity is in the center of the umbonal region. Right valve unknown. Hinge-line short, straight, length less than one-half the transverse diameter of the valve, extending farther toward the posterior than toward the anterior margin. Beak obtuse, rounded, central to the body of the shell, depressed, not rising above the hinge-line, nor extending to the hinge-margin; umbonal region moderately convex, not defined laterally. Anterior ear small, narrow-triangular, not well-defined; extremity very obtuse, rounded; margin slightly concave without a decided byssal sinus. Posterior ear triangular, more than twice the length of the anterior and defined from the umbonal slope by the absence of the strong radii; extremity acute-angular; margin marked by a broad, rounded sinus.

Test marked by about 40 strong, elevated rays, which are somewhat flattened along their summits; usually alternating with one or two sharp or rounded rays, crossed by very fine, sharp, concentric striæ. The radii gradually diminish in strength toward the ears, where they are represented by elevated, narrow lines. Ligamental area marked by several logitudinal striæ.

The height of the specimen is 97 mm., length 104 mm., hinge-line 44 mm. Three of the stronger rays occupy a space of 12 mm. at the basal margin.

The specimen described is the impression of the exterior of a left valve; it is quite characteristic and very distinct from other known species in its form and surface markings. In ornamentation and general outline there is some resemblance between this shell and *L. macrodontus*, but it is less convex, the rays are more elevated, and more sharply defined. The geological horizons of the two species are also widely separated.

Formation and locality. In coarse, arenaceous slates of the Upper Chemung group, at Montrose, Susquehanna county, Penn.

LYRIOPECTEN ANOMIÆFORMIS.

Lyriopecten anomiæformis, HALL. MS. for vol. v, pt. 1. 1877.

Lyriopecten anomiæformis, HALL. S. A. MILLER. Cat. Amer. Pal. Foss. 1877.

Lyriopecten anomiæformis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 4, fig. 10; pl. 10, fig. 5. Jan., 1883.

SHELL larger than medium size, obliquely elliptical or obovate; height nearly equal to the length; the transverse axis makes an angle of about 45° with the hinge-line; margins regularly rounded anteriorly and along the base, becoming obscurely truncated on the upper postero-lateral portion of the shell. Left valve slightly convex. Right valve nearly flat. Hinge-line straight, anterior; length equal to one-half the transverse diameter of the shell. Beak of left valve obtuse, rounded, oblique, not well-defined, situated anterior to the middle of the hinge, and extending to the hinge-margin, but not rising above it. Beak of right valve scarcely defined. Anterior ear small, obscure, only indicated by the short portion of the ligamental area anterior to the beak. Posterior ear undefined triangular; margin straight; extremity obtuse. Byssal sinus in the left valve a small notch; in the right valve a very deep, elliptical sinus.

Test thin, marked on the left valve by numerous fine, thread-like radii, of which every fourth to eighth one is much stronger than the intermediate lines, crossed by fine striæ of growth; the larger rays are about 20 in number. On the right valve the radii are represented by obscure, undulating, unequal striæ. The ears show the same surface markings. Cartilage-pit small. Ligamental area thickened, with about eight flat, longitudinal lines extending to the extremities of the hinge.

A left valve measures 62 mm. from the anterior ear to the postero-basal margin ; from the extremity of the beak the height is 55 mm., and the length, parallel to the hinge, is about 54 mm. ; hinge-line 27 mm. The right valve is imperfect, but it appears to have been more circular in outline than the left.

This species is characterized by its form, surface ornamentation, and marked resemblance between its right valve and the lower valves of some species of the recent genus ANOMIA, in the flatness of the valve and deep sinus.

Formation and locality. In the slates of the Chemung group, at Chemung Narrows, Chemung county, N. Y.

LYRIOPECTEN PRIAMUS.

Lyriopecten Priamus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations : Pl. 10, figs. 1, 2. Jan., 1883.

SHELL large, transversely broadly elliptical or ovate, wider below : transverse axis normal or very slightly oblique to the hinge-line ; height less than one-tenth greater than the longitudinal diameter ; margins regularly rounded. Left valve moderately and symmetrically convex. Right valve unknown. Hinge-line straight, subcentral ; length about one-half the longitudinal diameter of the shell. Beak obtuse, rounded, oblique, anterior to the transverse axis, not rising above nor extending as far as the hinge-margin. Anterior ear small and undefined. Posterior ear broad-triangular, flat ; margin concave ; extremity angular. Byssal sinus not defined.

Test marked by about 40 strong, rounded, irregular radii with narrow interspaces, crossed by fine striæ of growth. The rays are often composed of fascicles of thread-like striæ, and bifurcate at some point of their length. On the posterior ear the rays are subdued and finer. Ligamental area 2.5 mm. wide in mature specimens, and marked by numerous sharp, elevated, parallel, longitudinal striæ extending to the extremities of the hinge-line. Cartilage-pit triangular, narrow, situated at the apex of the beak, and extending to the margin of the hinge.

One large specimen, which is a cast of the interior, measures 72 mm. in height, 70 mm. in length ; hinge-line 32 mm. A smaller specimen, showing the exterior, is 63 mm. in height, 57 mm. in longitudinal diameter, and hinge-line about 31 mm.

In general appearance of surface this shell is similar to *L. macrodontus*, but the details are quite different. This species, though characterized from the left valve only, is distinctly different from the others in form and surface ornamentation.

Formation and locality. Associated with numerous segments of crinoidal columns and rarely with any other fossils, in the upper part of the Chemung group at Franklin, Delaware county, N. Y.

LYRIOPECTEN FASCIATUS.

Pernopecten fasciculatus, HALL. MS., vol. v, pt. 1. 1877.
" " " MILLER, Cat. Amer. Pal. Foss. p. 200. 1877.
Not *Aviculopecten fasciculatus*, HALL.
Lyriopecten fasciatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 10, 11. Jan., 1883.

SHELL of medium size, very broadly ovate, erect; length a little less than the width; margins regularly rounded. Right valve convex, the greatest convexity one-third the width of the valve from the beak. Left valve unknown. Hinge-line short, straight. Beak acute, erect, prominent; umbonal region distinctly defined, subtending a right angle. Anterior ear small, scarcely defined, about half the length of the posterior one. Posterior ear triangular, defined by a well-marked sulcus; margin nearly straight; extremity obtuse. Byssal sinus shallow.

Surface ornamented by strong, low, broad, rounded radii, which increase by interstitial addition; and numerous sharp, elevated, radiating striæ mark the surface of the rays, giving them a distinctly fasciculated aspect. These also mark the interspaces, which are narrower than the large rays. Sharp, regular, concentric striæ cancellate the radii. The ears are marked only by the concentric striæ, which are less prominent than on the body of the valve.

The specimen described is a right valve, having a length of 34 mm., height 36 mm., and hinge-line about 10 mm.

In outline and surface characters this species resembles *L. Priamus*, but the valve is more convex than the specimen referred to the right valve of that species; it is also less oblique, and the beak more elevated and erect. The rays of *L. Priamus* are distinctly and frequently bifurcating, while in this species the fasciculate appearance is due to the sharp, elevated striæ upon the stronger rays.

Formation and locality. Chemung group, Leon, Cattaraugus county, N. Y.

LYRIOPECTEN SOLOX.

Lyriopecten solox, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 24, fig. 5. Jan., 1883.

SHELL of medium size, nearly circular; transverse axis not inclined to the hinge-line; margin regularly rounded, and sloping somewhat abruptly into the byssal sinus. Right valve moderately convex. Left valve unknown. Hinge-line straight, length about one-half the diameter of the shell, extending farther on the anterior side. Beak obtuse, rounded, central, not rising above the hinge-line, directed slightly forward; umbo ample. Posterior ear triangular, defined by its flattened surface, and the rapid umbonal slope; margin concave; extremity rectangular. Anterior ear imperfect, but showing a very deep and narrow byssal sinus.

Test marked by numerous fine, angular rays, which are arranged in about 40 regular, rounded plications, composed of fascicles of finer rays, with defined interspaces. Finer obscure rays mark the umbo, and the posterior ear shows three or four hundred undulations with lines of growth. Interior not known, except the ligamental area, which is narrow, and makes an inflection of the hinge-margin of the ears.

The dimensions of the right valve described are as follows: height 43 mm., longitudinal diameter 42 mm., and hinge-line apparently about 25 mm.

This species differs from *L. Polydorus* by its circular outline, convexity, obtuse beak, ample umbo and surface characters It differs from *L. magnificus* and *L. macrodontus* in the greater convexity of the valve and fullness of the umbo, as well as in the character of the rays. It is also much smaller than those species.

Formation and locality. In a fine semi-calcareous, argillaceous sandstone (lying above the conglomerate ?) of the Upper Chemung group, near Panama, Chautauqua county, N. Y.

PTERINOPECTEN, HALL.

PTERINOPECTEN MULTIRADIATUS.

Pterinopecten multiradiatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, figs. 6, 7. Jan., 1883.

SHELL large, rhomboidal; body of the valve longitudinally obovate; length and height nearly as five to four; anterior and basal margins regularly curved, the postero-basal margin produced and the body of the shell extending thence in a direct line to the beak. Left valve moderately and regularly convex. Right valve unknown. Hinge-line straight, anterior, less than the length of the shell. Beak obtuse, rounded, directed forward, slightly rising above the hinge. Umbonal region ample, subtending an angle of about 105°. Ears triangular, flat, moderately well-defined; margins slightly concave; extremities rectangular. Posterior ear about twice the size of the anterior, limited by a stronger ray and the abrupt post-cardinal slope of the valve. The anterior ear is limited by a distinct but undefined sulcus. Byssal sinus scarcely marked.

Surface ornamented by numerous strong, distant, elevated, rounded rays, with interspaces marked by a strong ray in the center, and several finer ones on each side producing two series of alternations. Concentric striæ obscure. The arrangement of the rays gives the surface a fasciculate aspect, especially marked in the impression of the exterior. The rays on the posterior ear are sharp and simple, while on the anterior ear they are similar to those on the body of the shell.

The specimen has a length of 48 mm., height 35 mm., hinge-line about 36 mm.

This species is distinguished from *P. suborbicularis* by its greater length and doubly alternating radii. Though somewhat similar in form to *P. crenicostatus*, the surface characters are very different.

Formation and locality. In Corniferous limestone at Stafford, Genesee county, N. Y.

PTERINOPECTEN REFLEXUS.

Pterinopecten reflexus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal, moderately oblique; length one-sixth greater than the height; outline regularly curved to the postero-basal margin, thence extending posteriorly. Left valve depressed-convex; margin reflexed. Right valve unknown. Hinge-line straight, extended posteriorly, exceeding the greatest length of the shell. Beak obtuse, low, rounded, directed forward. Umbonal region convex, subtending an obtuse angle. Posterior ear large, flat, triangular, scarcely defined from the umbo; margin slightly convex; extremity obtuse. Anterior ear small, triangular, convex, limited by an undefined sulcus and a shallow byssal sinus; margin nearly straight; extremity obtuse.

Test marked by fine rounded striæ, alternating with finer lines; intermediate spaces flat. The same surface marking continues in a subdued degree upon the posterior ear, and somewhat more strongly on the anterior slope and anterior ear.

The specimen figured has a length, across the middle, of 18 mm., height 15 mm., hinge-line 22.5 mm.

In form, this species resembles *P. Hermes*, but is distinct in its smaller and less defined anterior ear, less strong radii, and more depressed beak. It is much flatter and of different proportions from *P. exfoliatus*.

Formation and locality. In the Corniferous limestone at the falls of the Ohio, near Louisville, Ky.

PTERINOPECTEN INSONS.

Pterinopecten insons, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations; Pl. 1. fig. 4. Jan., 1883.

SHELL small, rhomboidal, slightly oblique; length somewhat greater than the height; basal margin regularly rounded; the anterior and posterior sides become nearly vertical as they approach the ears. Left valve convex, the greatest convexity near the beak. Right valve unknown. Hinge-line straight, length one-fourth greater than the length of the shell, extended posteriorly. Beak acute, prominent, anterior to the middle of the hinge, directed forward. Umbonal region prominent, subtending a right angle. Ears triangular; margins straight; extremities acute. Posterior ear large, undefined. Anterior ear small, convex, with an undefined fold below the cardinal margin, limited by a distinct rounded sulcus. Byssal sinus slightly marked.

Test (in a partially exfoliated specimen) marked by regular, sharp, not numerous rays, with broad, flat interspaces, which, in a perfect condition, have probably been marked by fine striæ. The rays are obsolete over the posterior slope of the valve and the umbo, and also not preserved on either of the ears. Ligamental area narrow, appearing as a simple fold of the hinge-margin.

The specimen has a length of 13 mm., height 11 mm., hinge-line 16.5 mm.

In some of the modes of occurrence, this species resembles *P. exfoliatus*, but differs in its proportionally longer hinge-line, more extended posterior ear, comparatively larger anterior ear, and the greatest convexity is nearer the beak.

Formation and locality. Upper Helderberg limestone, Western New York. The particular locality unknown.

PTERINOPECTEN NODOSUS.

Pterinopecten nodosus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL small, sub-rhomboidal, slightly oblique; form not fully known. Left valve very convex. Beak prominent, nearly erect. Umbonal region very prominent, the limits distinct on the anterior and obscure on the posterior side; subtending an acute angle. Posterior ear large, triangular; margin very slightly concave; extremity angular. Anterior ear not preserved in the specimen.

Test thin, marked (in a partially exfoliated specimen) by strong, rounded rays with intermediate finer ones, and fine, concentric, undulating, elevated striæ, with numerous concentric undulations, which increase in frequency from the beak to the margin, and on crossing the larger rays, are elevated into strong nodes. On the posterior ear the rays are fine, equal and continuous.

This species is described from an imperfect specimen of the left valve; but it is so remarkable in its nodose undulations that it is readily distinguished from every other form.

Formation and locality. In the Corniferous limestone at the falls of the Ohio, near Louisville, Ky.

PTERINOPECTEN EXFOLIATUS.

Pterinopecten exfoliatus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, figs. 16, 17. Jan., 1883.

SHELL of less than medium size, sub-rhomboidal; body obliquely ovate; length somewhat greater than the height; pallial margins regularly rounded from the anterior ear to the base of the posterior slope, from whence the margin is nearly straight or slightly concave to the extremity of the hinge. Left valve very convex, inclined to gibbosity. Right valve moderately convex, much smaller than the left. Hinge-line straight, a little longer than the greatest length of the shell, extended posteriorly. Beak of left valve prominent, sub-acute, anterior to the middle of, and arching over the hinge-line, directed forward. Umbo prominent, gibbous, the greatest convexity being about the middle of the width subtending a right angle. Ears triangular. Posterior ear large, undefined; margin slightly concave; extremity somewhat acute. Anterior ear small, convex, defined by a deep, obtuse sulcus; margin convex; extremity acutely rounded. Byssal sinus distinct, somewhat deep.

Test thin, marked in the left valve by fine, regular, radiating striæ with flat interspaces which show one or two finer rays; crossed by concentric lines of growth and stronger undulations, which in old shells become very prominent. The rays are continued over the ears, and are somewhat subdued and less distinctly alternating on the posterior ears, and obsolete over the upper part of the umbo. The right valve is marked by obsolescent rays and concentric undulations. Ligamental area narrow.

Three specimens measure respectively as follows: length, 17, 20 and 22 mm., height, 15, 18 and 18 mm., length of hinge-line, 18, 21 and 23 mm.

In the exfoliated condition, this species resembles *P. insons;* but has a comparatively shorter hinge-line, smaller anterior ear, deeper byssal sinus, and less extended posterior ear. It is more gibbous and less oblique than *P. Hermes*, with less conspicuous striæ. The specimens are usually in the condition of partially exfoliated casts, and retain marks of only the stronger radii and concentric undulations. This species is not uncommon in the central and western portions of the State.

Formation and localities. In a limestone bed of the Marcellus shale at Avon, Livingston county, Stafford, Genesee county, and Vienna, Ontario county, N. Y.

PTERINOPECTEN DIGNATUS.

Pterinopecten dignatus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 1, figs. 12, 14, 15. Jan., 1883.

SHELL small, sub-rhomboidal, very slightly oblique; length and height as three to four; pallial margins regularly rounded, somewhat more produced on the postero-lateral portion. Left valve moderately convex. Right valve depressed, flatter and smaller than the left;

it differs in surface markings and depth of byssal notch, and is apparently thinner and more delicate. Hinge-line straight, length equaling, or greater than, the greatest length of the shell, extending anteriorly beyond the margin of the valve. Beaks obtuse, rounded, anterior to the center of the hinge-line, directed slightly forward. Umbonal region ample, subtending an acute angle. Ears triangular, flat. The posterior ear larger and less distinctly defined than the anterior; margin straight or slightly concave; extremity rectangular. Anterior ear rounded; margin convex; extremity acute-angular. Byssal sinus moderate in the left valve; deep, narrow and angular in the right valve.

Test of the left valve marked by numerous strong, rounded, increasing radii, with broader interspaces, containing one or two smaller rays which originate about the middle of the valve; crossed by fine, sharply elevated, concentric striæ. The right valve is marked by fine, sub-equal, regular, radiating striæ, which increase by interstitial addition, and become obsolete on the upper part of the umbo. The radii are also seen on the ears.

The largest specimen has a length of 19 mm., height 15 mm., hinge-line 19 mm. Another specimen measures 17 mm. in length, 14 mm. in height, with the hinge-line 18.5 mm.

This species closely resembles *P. lætus*, but differs in being less oblique, with greater height, more acute beak, fewer and stronger radii, and a characteristic concentric marking. From *P. Hermes* it differs in being less oblique, with the posterior ear less extended, and with finer rays upon the ears. From *P. conspectus* it differs in its greater length, and distinctly different surface markings of the left valve.

Formation and locality. In the Marcellus shale at Bloomfield, Ontario county, N. Y.

PTERINOPECTEN LÆTUS.

Pterinopecten lautus (in error), HALL. Pal. N. Y., vol. v, pt 1. Plates and Explanations: Pl. 1, fig. 13. Jan., 1883.

SHELL small, sub-rhomboidal, regularly rounded; length one-sixth less than the height. Left valve depressed-convex. Right valve unknown. Hinge-line straight, longer than the greatest length of the valve, extended anteriorly beyond the margin of the shell. Beak obtuse, anterior to the middle, directed forward, not prominent. Umbonal region scarcely defined, subtending about a right angle. Ears unequal, triangular. Posterior ear much the larger, undefined;

margin very slightly concave ; extremity rectangular. Anterior ear smaller, not distinctly defined from the body of the shell ; margin above the sinus convex ; extremity acute. Byssal sinus moderate.

Entire surface marked by distinct, close, rounded, duplicating radii, crossed by fine, concentric lines of growth. The surface of the umbonal region is wrinkled from the apex to below the middle of the valve. The surface markings are finer and sub-equal over the posterior ear. A small space on the umbo, as in *Aviculopecten bellus*, is destitute of radii.

This species differs from *P. Hermes* in its less oblique form, shorter hinge-line, less ample umbo, and in having no regular alternation in the rays, which are closer and more rounded. It is associated with, and closely allied to *P. dignatus*, but differs by its more obtuse beak, longer outline, and comparatively more frequent and smaller rays, without the regular concentric striæ.

Formation and locality. In the Marcellus shale at Bloomfield, Ontario county, N. Y.

PTERINOPECTEN HERMES.

Pterinopecten Hermes, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations : Pl. 17, figs. 13–15. Jan., 1883.

SHELL less than medium size, sub-rhomboidal, obliquely sub-ovate ; length and height about as three to four ; pallial margins regularly rounded, becoming straight on the post-cardinal slope at the junction with the ear. Left valve moderately convex. Right valve not determined. Beak acute, prominent, anterior to the middle of the shell, directed forward. Umbonal region ample, subtending an angle of about 80°. Ears very unequal, triangular. Posterior ear much the larger, scarcely defined ; margin concave ; extremity acute. Anterior ear small, slightly convex, defined by a distinct sulcus ; margin convex ; extremity rounded. Byssal sinus deep.

Test marked by regular, rounded striæ, with wider interspaces which, on the posterior part of the valve, show finer intermediate rays. The ears have essentially the same surface characters as the body of the valve. The entire surface is marked by fine concentric striæ. Umbo with concentric wrinkles. Partial casts of the interior show the same characters as the exterior, but show no muscular or pallial markings.

The largest specimen observed has a length of 19 mm., height 29 mm., hinge-line 29 mm.

This species is very similar in form to *P. lætus;* but the hinge-line is proportionally longer and the radii stronger and more distinctly alternating. It differs from *P. dignatus* in its more oblique form, proportionally greater diameter and sharper radii. From *P. conspectus* it differs in being much more oblique in outline and comparatively narrower.

Formation and locality. In shales of the Hamilton group, Ontario county, N. Y.

PTERINOPECTEN SPONDYLUS.

Pterinopecten spondylus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 17, fig. 16. Jan., 1883.

SHELL small, sub-rhomboidal, scarcely oblique; body of the shell ovate; length somewhat greater than the height; pallial margins regularly rounded, becoming straight on the posterior slope, which is continuous with the margin of the ear. Left valve convex. Right valve not known. Hinge-line straight, extended anteriorly; length greater than the longitudinal diameter of the shell. Beak obtuse, rounded, directed forward, situated anterior to the middle of the hinge-line. Umbonal region prominent, but not strongly defined on the posterior slope; subtending an acute angle. Ears broad-triangular, flat. Posterior ear much the larger, scarcely defined; margin slightly concave; extremity rectangular. Anterior ear defined by a distinct sulcus; margin convex; extremity rounded. Byssal sinus shallow.

Test marked by regular, sharp, elevated rays, with broader interspaces which are marked by finer rays, and concentric foliate lamellæ of growth, which are bent backward in crossing the rays, forming short semi-tubular spines. The radii are less conspicuous on the ears, which also show a few concentric undulations. The ligamental area appears as a simple fold in the hinge.

The specimen has a length of 15 mm., height 13.5 mm., hinge-line 18 mm.

This species has the general form and aspect of *P. Hermes* and *P. lætus,* but is proportionally wider, with different and characteristic surface markings.

Formation and locality. In soft shales of the upper part of the Hamilton group, shore of Canandaigua lake, Ontario county, N. Y.

PTERINOPECTEN CONSPECTUS.

Pterinopecten conspectus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 17, figs. 17–21. Jan., 1883.

SHELL of medium size, sub-rhomboidal; moderately oblique in young shells, scarcely oblique in older ones; length and height about equal, the length usually a little greater; pallial margins regularly rounded, straighter posteriorly, and merging into the ear without definite limitation. Left valve moderately convex. Right valve nearly flat, narrower and oblique, with a deeper byssal sinus. Hinge-line straight, nearly central, equaling, or a little greater than, the length of the shell. Beak sub-acute, anterior to the center of the hinge-line, directed slightly forward. Umbonal region somewhat prominent, subtending an angle of about 75°. Ears triangular. Posterior one much the larger, not distinctly defined on the valve; margin slightly concave; extremity rectangular or somewhat acute. Anterior ear small, distinctly defined by a rounded sulcus; margin convex; extremity rounded or sub-angular. Byssal sinus moderate in the left valve; deep and angular in the right valve, as seen in the specimen described.

Test of the left valve marked by comparatively few, strong, rounded radii, with intermediate smaller ones, crossed by fine concentric striæ of growth, and strong undulations which interrupt the continuity of the radii. Right valve marked by numerous subequal radiating striæ which are somewhat obsolete near the beak, and the umbonal region is marked by some strong concentric wrinkles. The ears present, in a less degree, the same ornamentation as the body of the shell. Ligamental area simple.

A mature specimen is 27 mm. in length and height, and the hinge-line 28 mm.

This species differs from *P. dignatus* in being less oblique, the anterior ear less extended, and the radii sharper and more interrupted. It differs from *P. lætus* and *P. Hermes* in the less obliquity and the stronger surface markings. It differs from *Aviculopecten* (*Pterina?*) *invalidus*, which is similar in general aspect, in being wider, and the margin of the posterior ear less concave.

Formation and localities. In the Hamilton group at Norton's Landing, Cayuga lake, and shores of Skaneateles lake, N. Y.

PTERINOPECTEN FILITEXTUS.

Pterinopecten filitextus, HALL. Pal. N. Y., vol, v. pt. 1. Plates and Explanations: Pl. 17, fig. 22. Jan., 1883.

SHELL larger than medium size, transversely semi-elliptical, scarcely oblique; length somewhat greater than the height; margins regularly rounded, less convex on the posterior side. Left valve moderately convex. Right valve flat or concave. Hinge-line straight, about as long as the length of the shell, not extended anteriorly beyond the margin. Beaks obtuse, anterior to the middle of the valve, directed forward, not well-defined. Umbonal region not strongly marked. Ears unequal. Posterior ear wide-triangular, extending as far as the margin of the shell, its limits undefined; margin nearly straight; extremity nearly rectangular. Anterior ear small, limited by a strong sulcus; margin concave; extremity obtuse. Byssal sinus in the left valve moderate; in the right valve well-marked.

Test of right valve thin, marked by fine filiform radii, with much wider interspaces which are marked by finer rays; the same character continuing on the posterior ear, with more equal rays. The entire surface is marked by fine, close, concentric lines of growth, with lamellose elevations at unequal intervals. Hinge-ligament marked by several parallel grooves.

A right valve measures approximately 35 mm. in length, and 29 mm. in height.

In general form this species resembles *P. conspectus*, but is proportionally longer, and the surface markings are different.

Formation and localities. In the Hamilton group near Cardiff, Onondaga county, and from a bowlder of Hamilton shale at Pine Valley, Chemung county, N. Y.

PTERINOPECTEN INTERMEDIUS.

Pterinopecten conspectus, in part, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 17, fig. 19. Jan., 1883.
Pterinopecten intermedius, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal, oblique; length one-fourth greater than the height; margins regularly rounded, more convex on the post-basal side. Left valve convex, greatest convexity below the umbo. Right valve unknown. Hinge-line straight, somewhat anterior; length greater than the length of the valve. Beak acute, well-defined, arching over the hinge, directed forward, situated anterior to the middle of the shell and of the hinge-line. Anterior ear small, triangular, with a longitudinal fold; limited by a broad sulcus; margin slightly convex; extremity acute. Posterior ear large, broad-triangular, undefined; margin slightly concave, extending at right angles to the hinge, to the post-basal side of the valve; extremity angular. Byssal sinus broad in the left valve.

Test thin, marked by fine, alternating, filiform, radiating striæ, which increase by implantation until they are very numerous at the basal margins of some specimens, crossed by fine lines of growth with a few concentric undulations. The ears preserve the same surface characters in a subdued degree. Many of the specimens are exfoliated and the surface markings are very obscure or obsolete.

A specimen of the left valve has a length of 14 mm., height 12 mm., hinge-line 16 mm. A larger example has a length of 19 mm., height 16 mm., and hinge-line 21 mm.

This species was arranged with *P. conspectus*. The recent study and comparison of a more numerous series of specimens show several important differences, and necessitate the removal of this form from that species. The present species is more oblique, narrower, and the posterior ear is comparatively longer than in authentic forms of *P. conspectus*. In *P. Hermes* the hinge-line is more extended posteriorly, and the umbonal angle more obtuse, while in *P. regularis* the hinge is shorter, the extremity of the posterior ear rounded, and the margin continuous with the curvature of the pallial margin of the valve.

Formation and localities. In the shales of the Hamilton group at Ludlowville, Tompkins county, and on the shores of Cayuga and Canandaigua lakes, N. Y.

PTERINOPECTEN REGULARIS.

Pterinopecten regularis, HALL. Pal. N. Y., vol. v, pt. 1, fig. 1. *Unpublished*.

SHELL of medium size, semi-circular; body of the valve oblique; length nearly one-fifth greater than the height, greatest length above the middle; margins very full and regularly rounded from the byssal sinus to the posterior extremity of the hinge. Left valve moderately convex. Right valve unknown. Hinge-line straight, anterior; length a little greater than the length of the valve. Beak of left valve acute, directed forward, situated anterior to the middle of the hinge. Anterior ear small, triangular, more than half as long as the posterior ear, limited by a broad sulcus; margin convex; extremity rounded. Posterior ear large and undefined from the body of the valve; margin convex, in regular continuation with the pallial margin; extremity obtuse-angular. Byssal sinus broad.

Test thin, marked with numerous fine, alternating, filiform, elevated striæ which are crossed by irregular lines of growth. The ornamentation of the ears is somewhat more subdued than on the body of the valve. Muscular impression small, ovate, situated below the middle of the post-cardinal slope.

A specimen of the left valve has a length of 24 mm., height 19 mm., hinge-line 25 mm. A larger example measures 30 mm. in length.

This species is distinguished for the regular, continuous convex curvature of the outline from the byssal sinus to the posterior extremity of the hinge. In this respect it differs from any other form of this genus here described. The right valve of *P. filitextus* has a similar outline, but the left valve has been shown to have the margin of the posterior ear concave and the extremity acute-angular.

Formation and localities. In the shales of the Hamilton group, between Geneseo and Avon, and at Delphi, N. Y.

PTERINOPECTEN VERTUMNUS.

Pterinopecten Vertumnus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 5, figs. 1–8. Jan., 1883.

SHELL large, rhomboidal, oblique; greatest length below the middle of the valve; length about one-fifth greater than the height; margins regularly rounded, becoming full behind and sloping rapidly to the hinge-line. Left valve depressed-convex. Right valve nearly flat. Hinge-line straight, somewhat shorter than the length of the shell. Beaks obtuse, low, anterior to the middle of the hinge-line, directed forward. Umbonal region moderately convex in the left valve, depressed in the right valve, limits defined anteriorly, but not posteriorly. Ears triangular, flat. Posterior ear much the larger, not defined from the body of the valve; margin gently concave; extremity acute. Anterior ear small, separated from the umbo by an undefined sulcus, and in the right valve by the marked, angular byssal sinus; margin concave; extremity acute, sometimes rounded.

Surface of left valve marked by irregularly alternating, strong, flexuous, flattened radii; interspaces flat; crossed by sharp, elevated, concentric striæ which are more closely arranged toward the margin of the shell. The same character of surface continues over the ears, and on the posterior ear the radii are finer, nearly equal in strength, and crenulated by the concentric striæ. On the right valve the rays are more equal and finer than on the opposite valve; conspicuous on the posterior ears and subdued on the anterior.

Three specimens have respectively the following dimensions: length 38, 40 and 41 mm., height 30, 33 and 29 mm., hinge-line 35, 35 and 32 mm.

This species resembles *Pterinea reproba*, from the shales of the Chemung group at Ithaca, which has straighter and more rounded radii in the left valve, with sharper intermediate radii and more elevated, undulating, concentric striæ. The right valve of that species is more convex with stronger and often duplicating radii; while the byssal sinus is less distinctly marked. The present species differs from *Pterinopecten dispandus* in its greater length, proportionally longer hinge-line, less strongly marked right valve, and want of duplication in the radii.

Formation and locality. This species is common in the shales of the Hamilton group at Bear gulf, Schoharie county, N. Y.

PTERINOPECTEN UNDOSUS.

Aviculopecten undulatus, HALL. MS. 1877.

" " " S. A. MILLER. Cat. Amer. Pal. Foss. 1877.

Not *Pecten undulatus*, MCCOY. Carb. Foss. of Ireland, p. 101, pl. xvii, fig. 12. 1844.

Not *Aviculopecten undulatus*, MCCOY. 1853.

Pterinopecten undosus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 2, figs. 10–19. Jan., 1883.

SHELL larger than medium, rhomboidal or sub-orbicular; left valve moderately oblique; right valve scarcely oblique; length one-third greater than the height, proportionally shorter in young shells and in the right valve; anterior and basal margins regularly rounded, somewhat produced behind, and receding rapidly toward the hinge-line. Valves nearly equally convex; the right valve a little less convex, more orbicular in outline, with deep byssal notch, and different surface markings. When occurring in the softer shales, the valves are often depressed-convex. Hinge-line straight, length a little less than the height of the shell, nearly central. Beak obtuse, rounded, scarcely rising above the hinge-line, anterior to the middle of the shell, inclined forward. Umbonal region ample, well-defined, subtending a very obtuse angle. Ears sub-equal, triangular; margins concave. Anterior ear limited by a sulcus and shallow sinus; extremity acute. In the right valve sub-triangular; margin rounded, defined by an abrupt sulcus and a deep, angular byssal notch, which encroaches on the body of the valve. In the posterior ear the extremity is obtuse in the left valve, somewhat more pointed in the right valve.

Test thin, marked by numerous fasciculate rays, which increase by interstitial addition, with interspaces varying from nearly equal to several times the width of the rays; cancellated and sometimes crenulated by elevated, lamellose striæ of growth; and by from three to ten strong, concentric undulations, which are rounded upon the summits. The markings on the ears are similar to those on the body of the shell; the rays on the anterior ear are sometimes obscured by the striæ of growth. Ligamental area narrow.

A left valve has a length of 51 mm., height 36 mm., hinge-line 36 mm. A right valve has a length of 44 mm., height 37 mm., hinge-line 35 mm. A young specimen has the following dimensions length 23 mm., height 19 mm., hinge-line 20 mm.

This species is distinctly characterized by the strong, concentric wrinkles, the deep byssal sinus of the right valve, and by the form of the shell. Specimens vary in the frequency and elevation of the radii, and in the number and prominence of the concentric undulations. The specimens are casts of the interior, with scarcely any remaining test. The surface markings are therefore subdued, and the concentric striæ are often not at all preserved. This species is widely distributed. It has been found in the Corniferous limestone at a single locality; and in the soft shales of the Hamilton group throughout the western portion of the State.

Formations and localities. In the Corniferous limestone at Clarence Hollow, Erie county, and in shales of the Hamilton group at numerous localities in Central and Western New York.

PTERINOPECTEN (AVICULOPECTEN ?) STRICTUS.

Pterinopecten strictus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 24, fig. 2. Jan., 1883.

SHELL of medium size, transversely semi-elliptical, not oblique; body of the shell ovate, length one-sixth less than the height; anterior and basal margins rounded; posterior margin straight. Left valve moderately convex. Right valve flat. Hinge-line straight, equal to the length of the shell, central as regards the transverse axis. Beaks obtuse, low, directed slightly forward, anterior to the middle of the hinge-line. Umbonal region moderately prominent in the upper part, subtending an acute angle. Ears triangular. Posterior ear much the larger, flat; margin concave; extremity slightly acute, obscurely defined. Anterior ear small, convex, defined by a well-marked groove or sulcus; margin rounded; extremity acute. Byssal sinus distinct in the left valve, and a deep rounded notch in the right valve.

Test of left valve marked by alternating stronger and finer rounded radii, crossed by sharp, elevated, concentric lines of growth and more distant undulations, with imbricating lamellose lines. These markings are continued over the ears, much subdued on the right valve, and obsolete upon the umbo. Ligamental area marked by two or three furrows, and a central cartilage-pit.

The specimen described has a length of 25 mm., height 30 mm., hinge-line 25.5 mm.

This species is doubtfully arranged with the present group of forms. In some aspects it resembles *P. conspectus*, but is specifically very distinct. It might be compared with the young of some large forms of LYRIOPECTEN or with AVICULOPECTEN, but the extent of the hinge-line, and the undefined limitation of the posterior ears, do not assimilate it with the ordinary characters ascribed to those genera.

Formation and locality. In the Chemung group near Elmira, N. Y.

PTERINOPECTEN IMBECILIS.

Pterinopecten imbecilis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 24, fig. 1. Jan., 1883.

SHELL small, rhomboidal, oblique, much longer than high; anterior and basal margins rounded; posterior margin produced. Left valve moderately convex. Right valve not known. Hinge-line equal to, or greater than, the length of the body of the shell. Beak obtuse, directed forward, rather prominent. Umbonal region ample, defined anteriorly; subtending an angle of about 90°. Ears very unequal, triangular. Anterior ear small, defined by a distinct sulcus. Posterior ear large, undefined; margin concave; extremity angular.

Surface marked by numerous strong, simple radii, with wider interspaces which have usually finer intermediate radii; crossed by fine, equal concentric lines of growth, and stronger, more distant lamellæ, which are elevated and arched backwards over the larger rays, producing nodes.

The specimen has a length of 15 mm., height 11 mm., hinge-line about 15 mm.

This species differs from *P. lætus*, by its distinct and widely separated rays, and more oblique outline.

Formation and locality. In the Chemung group at Tioga, Tioga county, Pa.

PTERINOPECTEN DISPANDUS.

Pterinopecten dispandus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, somewhat rhomboid-ovate, oblique, varying with the age of the shell; length a little greater than the height; margins regularly curved, extending behind. Left valve convex. Right valve depressed-convex, somewhat smaller than the left, and proportionally longer. Hinge-line straight, less than the greatest length of the shell, nearly central. Beaks obtuse, little elevated, anterior to the middle, directed forward. Umbonal region scarcely defined, moderately prominent, subtending a right angle. Ears triangular, undefined; margins concave. Posterior ear larger than the anterior. Anterior ear limited by an undefined sulcus and moderate sinus; extremity rounded. In the right valve the anterior ear is narrow, acute, with a deep, angular byssal sinus.

Surface ornamented by prominent, rounded radii, which alternate irregularly with finer intercalated radii, and increase in size and number toward the margin; crossed by concentric striæ, with more distant varices of growth which crenulate with radii. The rays are stronger over the anterior slopes, and are continued on the ears, somewhat finer on the posterior and stronger on the anterior. In the right valve the strong rays are regularly duplicating, and are finer and equal on the posterior ear, with a few stronger ones on the anterior ear. Ligamental area narrow.

Two left valves measure respectively 45 and 37 mm. in length, 42 and 44 mm. in height, hinge-line 40 and 30 mm. A right valve is 32 mm. in length, 27 mm. in height, hinge-line 28 mm. Other specimens of the left valve vary considerably, apparently according to age.

This species differs from *P. Vertumnus* in its greater proportional height, shorter hinge-line, abruptly rounded radii, and much sharper small intermediate striæ. The radii upon the right valve are also stronger and distinctly bifurcating: the concentric striæ are stronger, closer, and crenulate the rays more distinctly. *P. suborbicularis* is less oblique and the form more rounded, while the rays are more numerous and closely arranged.

Formation and localities. In the Chemung group at Belmont, Alleghany county, N. Y., and Mansfield, Tioga county, Pa.

PTERINOPECTEN ERECTUS.

Pterinopecten erectus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above medium size, transversely semi-elliptical, scarcely oblique; length and height nearly equal; pallial margins regularly rounded, slightly extended on the posterior side. Valves moderately convex. Right valve apparently more convex than the left; the differences between them have not been satisfactorily determined. Hinge-line straight, length a little greater than the length of the shell. Beak small, acute, directed forward, little elevated above the hinge-margin; anterior to the middle of the shell. Umbonal region not defined. Ears triangular, unequal. Posterior ear large, undefined; margin slightly concave; extremity acute. Anterior ear much smaller, not defined; margin concave; extremity acute. Byssal sinus shallow.

Surface marked by numerous rounded unequal radii; the larger ones alternating with one, two or three smaller ones; crossed by fine, sharp, regular, concentric striæ of growth. On the ears the striæ are fine and uniform. Ligamental area narrow. The largest specimen has a length of 32 mm., height 30 mm., hinge-line about 34 mm.

There is some resemblance between this species and *P. dispandus,* but it differs in its comparatively smaller size, longer hinge-line, and somewhat less oblique form.

Formation and locality. In the shales of the Chemung group at a point 600 feet above the base of the formation, at Ithaca, N. Y.

PTERINOPECTEN CRENICOSTATUS.

Pterinopecten crenulatus (by error), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 8, figs. 3, 4. Jan., 1883.

SHELL large, sub-orbicular, slightly oblique; length somewhat greater than the height; pallial margins regularly curved, broadly rounded from the antero-lateral to the basal margin; post-lateral margin less convex. Left valve very moderately convex. Right valve not known. Hinge-line straight, length one-fifth less than the length of the shell, extended anteriorly, but not as far as the anterior margin of the valve. Beak obtuse, rounded, scarcely directed forward, prominent, anterior to the middle. Umbonal region wide, indistinctly defined on the posterior side, more distinctly limited anteriorly, subtending an angle somewhat greater than 90°. Ears triangular, flat. Posterior ear five times as large as the anterior, undefined; margin straight or slightly concave; extremity abruptly acute. Anterior ear small; margin deeply concave from the byssal sinus; defined by a distinct sulcus; extremity acute.

Test apparently thick, marked by about fifty strong rounded rays which are simple or bifurcating, always with finer intermediate rays. Concentric striæ strong, elevated, conspicuously crenulating the radii. The radii mark the ears, and on the posterior ear are simple and distant.

Two specimens give about the following respective dimensions: length 56, 57 mm., height 47, 53 mm., and length of hinge-line 52 and 46 mm.

This species differs from *P. suborbicularis* in being more inequilateral, with longer hinge, and less stronger and frequent radii. It differs from *P. Neptunus*, by its more erect form, extended hinge-line, distant and elevated radii, with stronger and more elevated concentric striæ.

Formation and localities. In the shales of the Chemung group at Angelica and Conewango, N. Y., and at Mansfield, Tioga county, Pa.

PTERINOPECTEN NEPTUNUS.

Pterinopecten Neptunus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 8, figs. 5–7. Jan., 1883.

SHELL large, sub-orbicular, moderately oblique (more so in young shells); length one-fifth greater than the height; pallial margins regularly rounded, becoming extended posteriorly. Valves moderately and nearly equally convex; very similar in form and surface markings. Hinge-line straight, length less than the length of the shell, situated anteriorly as regards the body of the valve. Beaks obtuse, rounded, directed slightly forward, nearly erect, not prominent. Umbonal region wide and undefined posteriorly, subtending a very obtuse angle. Posterior ear much the larger, slightly concave on the margin; extremity angular. Anterior ear small, separated from the body of the shell by a sulcus; margin convex, extending obliquely outward from the byssal sinus; extremity acute.

Surface marked by closely arranged, rounded or sub-angular rays, which increase by intercalation and bifurcation. The ears are marked by simple and smaller rays, which in the right valve are distinctly angular. The rays become obsolete on the umbo. The concentric striæ are close, undulating, and in some conditions may have been sharply elevated and lamellose.

A specimen is 55 mm. in length, 46 mm. in height, hinge-line 38 mm.

The comparison of this species with *P. crenicostatus* is given under the description of that species. In surface ornamentation this species somewhat resembles *P. Vertumnus*, but the shell is shorter and less oblique, the hinge-line shorter, and the concentric striæ less elevated.

Formation and localities. In the shales of the Chemung group, Angelica and Philipsburg, Alleghany county, N. Y.

PTERINOPECTEN SUBORBICULARIS.

Pterinea ? suborbicularis, HALL. Geolog. Surv. N.Y.: Rep. Fourth Dist., p. 264. 1843.

Pterinopecten suborbicularis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations : Pl. 8, figs. 1, 2 ; pl. 24, fig. 10. Jan., 1883.

SHELL large, rhomboid-orbicular, slightly oblique; length a little greater than the height, or sometimes equal; pallial margins regularly curved, less convex on the posterior side; post-basal margin extended. Left valve convex. Right valve nearly flat; similar in general form and surface markings. Hinge-line straight, anterior, nearly equal to the length of the shell. Beak obtuse, broad, rounded, somewhat depressed, directed slightly forward, a little anterior to the center of the hinge. Umbonal region expanded, subtending an obtuse angle. Ears, triangular, unequal; extremities angular. Posterior ear the larger, undefined; margin concave. Anterior ear limited by an obscure sulcus. Byssal sinus shallow in the left valve, deep and angular in the right valve.

Surface marked by numerous regular, rounded or sub-angular radii, which increase on the left valve by intercalation, and on the right valve by bifurcation; interspaces nearly equaling the rays. On the posterior ear the rays are finer, and over the body of the shell they are strongly crenulated by lamellose concentric striæ. The ligamental area is a simple linear groove.

A large specimen measures 63 mm. in length, 55 mm. in height, the hinge-line 55 mm. Another one is 38 mm. in length, 35 mm. in height, with hinge-line 35 mm.

This species is distinguished by its sub-orbicular form, slight obliquity, nearly equal length and height, and comparatively short hinge-line. The comparison with *P. crenicostatus* is given under the description of that species. It resembles the young of *Lyriopecten orbiculatus*, but the details of the characters are quite different.

Formation and localities. In the Chemung group at Hobbieville and Elm Valley, Alleghany county; New Albion, Cattaraugus county, N. Y., and Mansfield, Tioga county, Pa.

CRENIPECTEN,* HALL.

CRENIPECTEN AMPLUS.

Crenipecten amplus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 9, 13. Jan., 1883.

Crenipecten crenulatus? HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, fig. 18. Jan., 1883.

SHELL larger than medium, broadly and obliquely ovate; height about one-sixth greater than the length; margins regularly rounded, more extended posteriorly. Left valve very convex. Right valve not known. Hinge-line straight, about equal to one-half the length of the shell, situated a little anterior to the middle. Beak obtuse, erect, prominent. Umbonal region very convex, well-defined, subtending a right angle. Ears nearly equal; margins gently concave. Posterior ear somewhat the larger, defined by a sulcus. Anterior ear defined by a sulcus which is more distinct and abrupt than in the posterior ear. Byssal sinus shallow.

Surface of the cast marked by fine, irregular, concentric striæ, with obsolescent, fine radiating lines. Ligamental area narrow and distinctly crenulate.

The largest specimen is 33 mm. in length, 38 mm. in height, hinge-line 16 mm.

This species differs from *P. crenulatus* in its proportionally greater height, rotundity, and less obliquity. Although known only as a cast, it is distinctly different from other species.

Formation and locality. In shales of the Chemung group at Rockville, Alleghany county, N. Y.

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*The forms here described under this generic term have in part been referred to PERNOPECTEN by Professor Winchell, but a critical study of the type species of that genus shows that it possesses a large central cartilage-pit with a crenulated hinge-plate on each side below the hinge-margin, which characters alone are sufficient to distinguish the genus and exclude the forms here described under CRENIPECTEN. See discussions of the relations of PERNOPECTEN, ENTOLIUM and CRENIPECTEN, in the introduction to Pal. N. Y., vol. v, pt. 1.

CRENIPECTEN CRENULATUS.

Pecten? crenulatus, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 265. 1843.

Crenipecten crenulatus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 6–8, 15–17. Jan., 1883.

SHELL of medium size, ovoid-orbicular, moderately oblique; length and height nearly equal; margins regularly rounded, somewhat extended posteriorly. Right valve convex. Left valve depressed-convex above, and nearly flat below. Hinge-line straight, length more than one-half the length of the valve, anterior to the middle of the shell. Beaks obtuse, central, inclined somewhat forward, not rising above the hinge-line. Umbonal region of the right valve prominent, subtending an angle of about 100°. Ears small, triangular, subequal, limited on the right valve by the rapid slope of the sides of the umbo; margins slightly concave; extremities angular. Byssal sinus not defined.

Test thin, conspicuously marked with fine, concentric striæ of growth, and obscure or nearly obsolete radii. The concentric lines are stronger on the ears, and are sometimes cancellated by fine rays. Ligamental area narrow, crenulated by a row of minute cartilage-pits.

A medium-sized specimen has a length of 29 mm., height 31 mm., hinge-line 17 mm. A smaller specimen has a length of 26 mm., height 29 mm., and hinge-line 16 mm.

All the specimens are in the condition of casts or much exfoliated, and the surface markings are therefore obscure. The species was originally founded upon specimens of the left valve; the right valves described occur in the same association, and have been identified as of the same species.

This species differs from *C. obsoletus* in its proportionally greater convexity and length, and the obliquity of the transverse axis. It is also longer than *C. amplus*.

Formation and locality. In shales of the Chemung group at Rockville, Alleghany county, N. Y.

CRENIPECTEN IMPOLITUS.

Crenipecten impolitus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, fig. 14. Jan., 1883.

SHELL of medium size, obliquely sub-ovate; length somewhat less than the height; anterior and basal margins regularly rounded, produced behind and extending thence in nearly a direct line to the beak. Left valve depressed-convex. Right valve not known. Hinge-line straight, anterior, less than half the length of the shell. Beak obtuse, rounded, low, inclined a little forward. Umbonal region scarcely defined, subtending about a right angle. Ears nearly equal; margins concave. The posterior ear extends along the posterior margin as a narrow expansion. In well-preserved specimens the ears are defined by sulci. Byssal sinus inconspicuous.

Obscure evidences of concentric striæ appear in the casts. Internal characters unknown.

Two specimens have respectively the following dimensions: length 24 and 16 mm., width 26 and 19 mm., hinge-line 9 and 7 mm.

In general form and convexity this species resembles *C. crenulatus*, but it is narrower above, with the hinge-line comparatively much shorter.

The specimens are casts of the interior preserved in coarse sandstone; the surface markings are consequently obliterated.

Formation and locality. In a coarse sandstone of the Chemung group near Olean, Alleghany county, N. Y.

CRENIPECTEN OBSOLETUS.

Lima? obsoleta, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 265. 1843.
Crenipecten obsoletus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations; Pl. 9, figs. 19, 21. Jan., 1883.

SHELL small, obliquely sub-ovate; length nearly equal to the height; margins regularly curved, becoming produced on the post-basal side, and somewhat rectilinear on the posterior side. Valves very similar. Right valve depressed-convex. Left valve regularly convex. Hinge-line straight, a little more than one-half the length of the shell. Beak obtuse, more prominent on the left valve; situated in the center of the hinge. Umbonal region well-defined in the left valve; depressed and undefined in the right valve. Ears small, triangular, sub-equal, defined by shallow sulci; margins gently concave; extremities obtuse. Posterior ear a little the larger. Byssal sinus not conspicuous.

Test thin, marked by fine, closely arranged, concentric striæ, which are crowded and stronger on the ears. No radiating striæ have been discovered. Ligamental area narrow, marked by a row of minute cartilage-pits.

A left valve measures 18 mm. in length, 20 mm. in height, hinge-line 10 mm. A similar right valve is 16 mm. in length, 17 mm. in height, hinge-line 8·5 mm.

This species bears some resemblance to *C. crenulatus*, but is more elongate-ovate; less oblique, with the height somewhat greater than length.

Formation and locality. In shales of the Chemung group at Philipsburg, Alleghany county, N. Y.

CRENIPECTEN GLABER.

Lima glaber, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 255. 1843.
Crenipecten glaber, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 20, 22? Jan., 1883.

SHELL small, ovate, erect, very slightly oblique; height about one-fifth greater than the length; pallial margins regularly rounded, more extended on the posterior side. Left valve moderately convex above, and depressed-convex below. Right valve unknown. Hinge-line straight, length equal to about one-half the length of the valve. Beak acute, erect, somewhat prominent, not elevated above the hinge. Umbonal region well-defined by the sulci, subtending an acute angle. Ears triangular, nearly equal, separated from the body of the shell by shallow sulci; margins straight or slightly concave; posterior ear a little the larger. Byssal sinus not distinct.

The cast is marked only by fine concentric striæ. Interior unknown. The crenulations of the ligamental area are obscure in the specimen.

The original of this species is 12 mm. in length, 16 mm. in height, and hinge-line 6 mm.

This specimen is imbedded vertically to the lines of rock bedding, and the proportions of length and height may have been changed. The species is known by its erect form, conspicuous ears and great comparative height.

Formation and localities. In shales of the Chemung group at Philipsburg and Rockville, Alleghany county, N. Y.

CRENIPECTEN MICROPTERUS.

Crenipecten micropterus, HALL. Pal. N. Y. vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 2, 3. Jan., 1883.

SHELL small, longitudinally and obliquely sub-elliptical; length somewhat greater than the height; margins regularly rounded, produced behind and extending in nearly a direct line to the beak. Right valve depressed-convex. Left valve unknown. Hinge-line short, straight, anterior; length about one-third the height of the valve. Beak low, obtuse. Umbonal region not strongly defined, subtending an obtuse angle. Ears very small, nearly equal, bounded by shallow sulci. Byssal sinus not distinct.

Surface marked by numerous low, rounded radii, with wider interspaces and smaller intermediate radii; crossed by fine concentric lines of growth, which are stronger and crowded on the ears, forming their only surface marking. Interior unknown. Ligamental area obscurely crenulate.

The specimen described has a length of 18 mm., width 16 mm., hinge-line 5 mm.

This species resembles in form *C. crenulatus*, but differs in the radii, and in the proportionally much shorter hinge-line. The surface markings are similar to *C. liratus*, but it is different in its proportions of length and height.

Formation and locality. In the shales of the Chemung group at Philipsburg, Alleghany county, N. Y.

CRENIPECTEN LIRATUS.

Crenipecten liratus, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, fig. 24. Jan., 1883.

SHELL small, obliquely sub-ovate; length a little less than the height; anterior and basal margins rounded; post-basal margin produced, and thence extending in a direct line to the beak. Left valve moderately convex, the greatest convexity distant one-third the height of the valve from the beak. Right valve unknown. Hinge-line straight, short; length about one-third the height of the valve. Beak acute, erect, a little anterior to the center of the shell, not rising above the hinge. Umbonal region moderately elevated, subtending an acute angle. Ears small, triangular, defined by moderate sulci; the posterior ear the larger. Byssal sinus not distinct.

Surface marked by prominent, rounded, alternating radii, with intermediate smaller ones. There are about six larger rays, six smaller, and twice that number of still smaller intermediate striæ, all crossed by strong, regular, concentric laminæ of growth. The ears are apparently destitute of rays. The crenulations of the ligamental area are small and obscure.

The specimen described has a length of 20 mm., height 22 mm., hinge-line 7 mm.

This species somewhat resembles *C. micropterus* in the radii, but differs in all other characters.

Formation and locality. Chemung group at East Randolph, Cattaraugus county, N. Y.

CRENIPECTEN LEON.

Crenipecten Leon, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, fig. 12. Jan., 1883.

SHELL of medium size, ovate, slightly oblique; length about one-sixth less than the height; margins regularly curved, produced below, rather straight on the upper part of the posterior side. Left valve moderately convex; the greatest convexity is a little below the middle. Hinge-line straight, short, nearly central; length about one-third the height of the valve. Beak acute, erect. Umbonal region not strongly marked, subtending an acute angle. Ears sub-equal, small, sulci not conspicuous; posterior ear the larger. A narrow rim, slightly elevated and free from rays, extends from the posterior ear along the margin of the shell.

Surface marked with numerous distinct, rounded or sub-angular rays, and wider interspaces with smaller intermediate rays, with fine concentric striæ and undulations at irregular intervals. The rays are stronger over the posterior half of the valve. Ligamental area linear, and crenulated with narrow cartilage-pits.

The specimen described has a length of 26 mm., height 30 mm., hinge-line 10 mm.

This species differs from all the others in its form and surface characters.

Formation and locality. In sandstone of the Chemung group at Leon, Cattaraugus county, N. Y.

CRENIPECTEN WINCHELLI.

Aviculopecten Winchelli, MEEK. Pal. of Ohio, vol. ii, p. 296, pl. 15, figs. 50, 56. 1875.

Crenipecten (*Pecten*) *Winchelli* (MEEK), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 9, figs. 1, 2, 4, 25–30. Jan., 1883.

SHELL larger than medium, flabelliform, equilateral, not oblique; length a little greater than the height; margins regularly rounded below. On the anterior side, from a point two-thirds the height of the valve above the base, the antero-cardinal margin extends in a direct line to the beak; the posterior side, from a point a little above the middle, also slopes in a direct line to the beak. Left valve moderately convex; the greater convexity about one-third the height of the shell from the beak. Right valve nearly flat, depressed-convex above. The right and left valves are unlike. Hinge-line straight, central, length about two-thirds the length of the shell. In several specimens referred to the right valve, the length of the hinge is nearly equal to the length of the valve. Beak of left valve acute, erect, prominent. Beak of right valve depressed, obtuse, not rising above the hinge-line. Umbonal region of left valve distinctly defined, subtending a right angle. Ears of left valve triangular, defined by shallow but distinct sulci. Margin of anterior ear convex, with a shallow sinus at the base. Posterior ear the larger; margin concave, with a comparatively broad sinus. The extremities of the ears in the right valve are acute. Byssal sinus deeper and more angular in the right valve.

Surface of left valve marked by numerous rounded or sub-angular, alternating rays, with somewhat wider interspaces, crossed by sharp, elevated, concentric striæ; the ears show the same markings. Right valve marked by obscure radii, which are stronger on the ears. Ligamental area with numerous narrow cartilage-pits.

A large left valve has a length of 47 mm., height 42 mm., hinge-line 29 mm. Another individual measures 27 mm. in length, 26 mm. in height, hinge-line 18 mm. A right valve referred to this species has a length of 20 mm. and a height of 18 mm., hinge-line 17 mm.

This species differs from any known form of CRENIPECTEN; it is like AVICULOPECTEN in external form and surface characters, and resembles the recent genus PECTEN. Mr. Meek compares this species with *Aviculopecten Coxanus*, Meek and Worthen, from the coal measures of Illinois and Nebraska. It is evident that the crenulations of the hinge have not been previously observed. The right and left valves have not been found in connection, but their association, and the absence of similar forms in the same beds, render the identity nearly certain. Except in the hinge crenulations this form has no other relations with the genus CRENIPECTEN, and it may be found to belong to some genus yet undescribed, which will include other species now placed with the carboniferous forms of AVICULOPECTEN. In the original description of that genus, McCoy has not indicated the intimate structure of the hinge, and it is not improbable that there are several generic types among the species included in the carboniferous forms of AVICULOPECTEN.

Formation and locality. In the Waverly sandstone near Newark, Ohio.

PTERINEA, GOLDFUSS.

PTERINEA GRANDIS.

Pterinea grandis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL very large, capacious, oblique, sub-rhomboidal, body broadly ovate; length about one-fifth greater than the height; margins regularly rounded, broad along the base, and a little produced on the posterior side. Left valve convex. Right valve unknown. Hinge-line straight, apparently somewhat less than the length of the valve (imperfect in the specimen). Beak obtuse, prominent, directed forward. Umbonal region gibbous, subtending an angle of about 90°. Wing large, triangular, not distinctly defined, margin rounded, with a gentle concavity near the junction of the valve. Ear not observed.

Test thick, marked by distant, strong radii from the umbo to the base; the interspaces having alternating larger and smaller rays; crossed by concentric, undulating lamellose striæ of growth.

The specimen has a length of 120 mm., height 100 mm., and the hinge-line, from the beak to the extremity of the wing, 95 mm.

This species is distinguished by its large size, very distant strong radii, and convexity. Compared with *P. flabella*, it is proportionally longer, and the wing less defined. Compared with *P. pinguis*, it differs in greater length and somewhat less gibbosity.

Formation and locality. In the upper Helderberg limestone in Scott county, Indiana.

PTERINEA PINGUIS.

Pterinea pinguis, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 15, figs. 2, 3. Jan., 1883.

SHELL large, gibbous, obliquely ovate, length and height nearly equal; pallial margins rounded, produced on the posterior basal side, and concave at the junction of the wings. Left valve ventricose, subangular along the anterior side. Right valve unknown. Hinge-line straight, nearly central; length somewhat greater than the length of the shell. Beak acute, angular, arching over the hinge, situated near the anterior extremity of the hinge-line, directed forward. Umbonal region prominent, ventricose, defined, subtending an acute angle. Wing large, triangular, limited by the rapid post-cardinal slope of the valve; margin slightly concave, rounding to the extremity which is angular. The extent of the ear is not known, but it is limited by a deep sulcus which gives an angular aspect to the antero-cardinal slope of the shell. Byssal sinus not marked in the specimens.

Surface ornamented with about fifteen broad, strong, rounded rays, crossed by lamellæ of growth. The specimens described are weathered casts of the interior and preserve only slight evidence of the surface characters.

The largest specimen has a convexity of about 20 mm., its length is 70 mm., height 65 mm., and hinge-line more than 65 mm. Another example has a convexity of about 20 mm., length 63 mm., height 74 mm., hinge-line 55 mm.

This species bears some general resemblance to *P. flabella;* it differs in its large ventricose form, more elevated umbo, the characteristics of the upper part of the anterior side of the body, and the abrupt slope into the wing without a distinct sulcus.

Formation and locality. In the Corniferous limestone, near Columbus, Ohio.

PTERINEA FLABELLA.

Avicula tuberculata, CONRAD. Geolog. Surv. N. Y.: Ann. Rep., p. 117. 1838.

Avicula flabella, CONRAD. Jour. Acad. Nat. Sci., Phila., vol. 8, p. 238, pl. 12, fig. 8. 1842.

" " (") VANUXEM. Geolog. Surv. N. Y.: Rep. Third Dist., p. 152. 1843.

Compare *Pterinea fasciculatus,* GOLDFUSS. Petrefacta Germaniæ, p. 137, pl. 120, fig. 5. 1840.

" " " (") Sandberger, Verstein, Rhein, Schichtensyst, Nassau, p. 293, pl. 30, fig. 7. 1856.

Compare *Pterinea costulata,* F. A. ROEMER, DUNKER and VON MEYER. Palæontographica, T. 1, fig. 2.

Pterinea flabella (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 14, figs. 1–21; pl. 15, figs. 1, 4–6, 8–10. Jan., 1883.

SHELL large; body broad or narrow ovate, oblique, rarely erect; length from two-thirds to nearly equal the height; and in some extravagant forms the height is about double the length; the greatest length below the middle; anterior and basal margins regularly curved; the posterior margin from a little above the base, follows a nearly straight line to the beak. Left valve more or less convex, often gibbous and arcuate. Right valve flat or concave, with a little convexity on the umbo; arcuate, to correspond with the curvature of the opposite valve. Hinge-line straight, extended upon the posterior side; length greater than the length of the valve. Beak of left valve acute, rounded, situated near the anterior extremity of the hinge, curving forward over the hinge margin. In rare instances the beak does not extend quite as far as the margin of the hinge. Umbo of the left valve prominent, gibbous, limited by the sulci of the cardinal expansions, and subtending an angle of from 30° to 60°. Beak of the right valve depressed, rounded, not rising above the hinge; umbonal region depressed-convex, gradually merging into the body of the valve, which is concave below. Wing large, triangular, nearly flat, varying in proportions, defined (in the left valve) by the post-cardinal slope; margin concave; extremity acute-rounded. Ear of left valve a simple rounded convex lobe or auriculation, defined by a distinct, broad, rounded sulcus; margin rounded above, sinuate at its junction with the valve, forming the byssal sinus. The cardinal expansions of the right valve are similar in dimensions to those of the opposite valve; nearly in the same plane with the body of the shell, and defined only by the surface striæ and the sinus.

Test strong, nacreous, often having a thickness of more than one millimetre. Left valve marked with from six to ten or twelve strong rounded rays, which originate at or near the beak and continue simple to the margin. The interspaces are marked by smaller, alternating costæ, increasing by interstitial addition as the shell increases in size. The surface is also ornamented with strong, elevated, concentric lamellose striæ of growth, which are more or less distinctly bent backward over the stronger radii. The cardinal expansions are marked with rays; those on the ear in well-preserved specimens are stronger than on the wing. In the partially exfoliated condition, and in the casts, the ears show the concentric striæ; and the wings show evidences of the rays. In some conditions the rays are nodose from the concentric laminæ, and in older examples there are undulations of growth which interrupt the rays and increase their nodose aspect. In the right valve the surface is marked with concentric lines which are more crowded on the cardinal expansions, and with a few strong radii on the wing, which are sometimes quite obsolete. The casts of the interior sometimes show traces of the stronger radii; but usually they are not preserved. In the various phases of maceration and exfoliation, the specimens present gradation from the finer radii to the stronger ones, and some specimens are quite destitute of surface markings. They vary also in the number of stronger radii, the development of the wing, the comparative length and width of the body, the arcuation of the valves, the prominence of the beaks, and the thickness of the test. In rare examples, the stronger rays below the umbo are broken up and merged with the finer striæ. The pallial line originates in a small, deep, anterior muscular impression just beneath the anterior tooth, and extends nearly parallel with the margin of the valve, almost two-thirds the distance from the beak to the base of the shell, where it is abruptly recurved, terminating in a large, ovate, posterior muscular impression directly below the posterior extremities of the lateral teeth. Ligamental area marked by a variable number of sharp, narrow grooves, which extend to the extremities of the hinge-line, and probably corresponding to the successive laminæ of growth. In the left valve, there are four or five linear, diverging cardinal teeth beneath and anterior to the beak; in the right valve only two or three such teeth are seen. Two or three linear, slightly diverging, lateral teeth, are situated below the ligamental area, and posterior to the umbo.

A young symmetrical specimen has a length and height (without the ear) of 15 mm.; and the greatest extent from the beak to the post-basal margin is 21 mm. A medium sized specimen is 36 mm. in vertical height; extreme distance from beak to base 47 mm.; length parallel to hinge-line 35 mm., and hinge-line from beak to extremity of wing 38 mm. Another is 46 mm. in vertical height; extreme distance from beak to base 52 mm.; length parallel to hinge-line 46 mm., and hinge-line from beak to extremity of posterior wing 56 mm. A specimen of different proportions is 52 mm. in vertical height, extreme distance from beak to post-basal margin 63 mm., length parallel to hinge-line 40 mm., hinge-line from beak to extremity of posterior wing 40 mm.

This species in surface ornamentation differs greatly from every other form below the carboniferous period, and possesses true pterinoid characters in a stronger degree than any other species from the New York rocks. The right valve when detached is not so easily distinguished from some other forms, as *Pterinea Chemungensis* and *Actinoptera Boydi.*

The species is co-extensive with the Hamilton group throughout the State of New York. An apparently abnormal form, in its unusually large wing, found in the Chemung group, has been referred to this species; and specimens of similar character are common in certain localities.

The specimens occurring in the Chemung group are much larger, and of more extravagant growth, than any yet observed in the Hamilton group. A large specimen has a height of 100 mm.; another measures 90 mm. in length, and is of equal extent along the hinge-line. The costæ on these large forms are often only four in number and very strong and broad.

Formations and localities. This species has been recognized in a single ill-preserved specimen from the Corniferous limestone, at Stafford, Genesee county, N. Y.; casts of the interior, and a single extravagant form preserving the surface characters, have been obtained from limestone of the same age near Columbus, Ohio. It is abundant in the Hamilton group at numerous localities from Schoharie to Cayuga lake, more rarely in the western part of the State; though occurring at Hamburg and elsewhere on Lake Erie shore. It is found in the upper beds of the Chemung group in Steuben county, N. Y., and Tioga county, Pa.

PTERINEA INTERSTRIALIS.

Pterinea interstrialis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large; left valve obliquely ovate, narrow above; length and height nearly equal; anterior and basal margins regularly curved; posterior margin produced. Left valve moderately convex, depressed toward base. Right valve unknown. Hinge-line straight, about equal to the length of the shell. Beak acute, inclined forward. Umbonal region not prominent, narrow, limited by the cardinal expansions; subtending an acute angle. Wing triangular, large; margin concave; extremity acute. Ear triangular, small.

Surface marked by about twenty regular, strong, rounded rays which originate on the upper part of the umbo and continue undivided to the margin; with broad, flat interspaces marked by from two to four slender, sharp radii, and crossed by fine concentric striæ. About twelve of the strong rays reach the margin of the valve below the middle of its height, the remainder come out on the upper anterior margin. The wing shows the radii somewhat less strong than the body of the valve. The ear is marked by strong radii.

The specimen described has a greatest length of about 55 mm., height nearly 58 mm., hinge-line, from beak to extremity of wing, about 58 mm.

This species somewhat resembles *P. flabella*; and differs in its less convexity, more numerous strong rays with finer intermediate lines, and less conspicuous concentric striæ.

Formation and locality. In sandstone of the Chemung group at Chemung Narrows, Chemung county, N. Y.

PTERINEA DISPANDA.

Pterinea dispanda, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 15, fig. 7. Jan., 1883.

SHELL large; body very broadly ovate, nearly erect; length greater than the height; anterior margin very convex; basal margin flattened, not produced posteriorly. Left valve regularly convex, and only moderately gibbous on the umbo. Right valve unknown. Hinge-line straight, greater than the length of the body, extended posteriorly beyond the margin of the valve. Beak anterior, nearly rectangular, prominent, directed forward. Umbonal region ample. Ear small, separated from the body of the shell by a broad undefined sulcus, which is marked by several oblique folds. Byssal sinus deep and abrupt. Wing very large, depressed-convex, broad-triangular; defined by the retral curving of the concentric striæ; concave on the margin; extremity extremely produced and acute.

Test ornamented with strong, unequal, rounded radii, which are sometimes bifurcating on the anterior portion. The wing is marked with similar smaller rays which are sometimes fasciculate. Entire surface also marked by concentric lamellose striæ, which at irregular intervals are crowded into fascicles, giving an undulating aspect to the surface, and a low nodose appearance to the stronger rays.

The specimen described has a height of 70 mm., length about 80 mm., and the length of the hinge-line about 90 mm.

This shell bears some resemblance to the more extravagant forms of *Pterinea flabella*, but it is larger than any known specimen of that species, with a proportionally longer and less defined body, and distinctly different surface ornamentation.

Formation and locality. In the upper beds of the Chemung group at Mansfield, Tioga county, Pa.

PTERINEA CHEMUNGENSIS.

Avicula Chemungensis, CONRAD. Jour. Acad. Nat. Sci., Phila., vol. 8, p. 243. 1842.

Avicula pecteniformis, HALL. Geolog. Surv. N. Y.: Rept. Fourth Dist., p. 262. 1843.

Pterinea Chemungensis (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 16, figs. 3, 7, 10, 12. Jan., 1883.

SHELL very large, rhomboidal; body of shell ovate, narrower above, nearly erect, or sometimes oblique; length less than the height; greatest length below the middle; basal and post-basal margins rounded; the anterior margin above the middle is nearly straight, and the corresponding portion of the posterior margin is gently concave. Left valve moderately convex above, depressed-convex in the lower part. Right valve depressed-convex toward the beak, flat or slightly concave below. Hinge-line straight, central; length nearly or quite equal to the length of the shell. Beak anterior, acute, directed forward, arching a little over the hinge-line. Umbonal region not strongly defined, most prominent a little below the hinge; subtending an acute angle. Ear short, nearly equilateral, limited by a rounded sulcus; margin concave, with a marked sinuosity and arching of the shell for the byssal sinus. Wing large, triangular, and extending beyond the posterior margin of the valve, not distinctly defined by a sulcus or by marked change in the surface characters from the body of the shell; margin straight or slightly concave; extremity obtuse. In the right valve the wing is less distinctly defined than in the left.

Test somewhat thin; left valve marked by slender, filiform rays variously alternating and bifurcating, or sometimes simple from the umbo to the base, continuing over the wing, and somewhat stronger on the anterior cardinal extremity than on the posterior; the interspaces flat, much wider than the rays. The surface is crossed by fine, closely arranged, concentric striæ, which are occasionally crowded, giving an unequal elevation to the rays. These are also often interrupted and undulated, either from accident to the shell or intermittent growth, and are sometimes nearly obsolete at the base. The right valve is marked by the same interrupted rays on the wing; on the body of the shell the radii are obsolete, but the concentric striæ are preserved. The specimens are generally found as casts, or in an extremely macerated condition. Ligamental area wide, marked by fine, narrow grooves the whole length of the hinge. Obscure indications of lateral teeth have been seen.

A left valve is 62 mm. in length, 76 mm in height, hinge-line 55 mm. Another one has a length of 55 mm., height and hinge-line each 62 mm. A very large specimen is 85 mm. in height, 102 mm from beak to post-basal margin, length 70 mm., hinge-line about 65 mm. A right valve has a length of 55 mm., height 60 mm. hinge-line about 60 mm.

The form varies from nearly erect to considerably oblique, and i usually characterized by the broadly rounded base and interrupte rays, which are coarse and fine, and irregularly arranged.

This species resembles *P. rigida*, but the radii have an appearanc of less rigidity, the hinge-area is narrower and the shell is mor oblique. It is closely allied to *P. consimilis*, differing in the propor tionally shorter hinge-line, greater height of body, and less obliquity

Formation and locality. In the Chemung group at Chemung Narrows, Chemung county, N. Y.

PTERINEA CONSIMILIS.

Pterinea consimilis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 15, figs. 1, 2, 8, 9, 11. Jan., 1883.

SHELL large, sub-rhomboidal, nearly orbicular; length greater than the height; margins regularly curved, moderately produced on the posterior end. Left valve convex above, depressed-convex below. Right valve convex on the umbo, flat or slightly concave below. Hinge-line straight, length equal to or a little greater than the length of the valve. Beak acute, anterior, inclined slightly forward, not rising above the hinge. Umbonal region prominent but not strongly limited, subtending more than a right angle. Ear small, limited by the abrupt slope of the umbo, which becomes a distinct sulcus in the right valve; margin convex (except in the byssal sinus); extremity rounded. Byssal sinus not distinct. Wing broad, triangular, undefined, much extended; margin concave; extremity acute.

Surface of left valve marked by numerous flattened, slender, filiform rays, with broad, flat interspaces, which are marked by one or two, more or less distinct, finer rays. The radii are often undulating, and become obscure toward the base. The cardinal expansions are correspondingly marked. Fine, closely arranged, inconspicuous concentric striæ cross the surface. The wings of both valves are similar in surface characters. The body of the right valve shows the concentric striæ, with obscure indications of rays. Ligamental area broad, marked by fine parallel grooves the entire length. Lateral teeth two, strong, converging. Cardinal teeth preserved as three short plications under the beak of the left valve. Pallial line simple, originating anterior to the beak, continuing nearly parallel to the margin of the valve, recurving and terminating in a large muscular scar on the post-cardinal slope adjacent to the wing.

A left valve has a length of 52 mm., height 49 mm., hinge-line about 50 mm. A right valve has a length of 46 mm., height 40 mm., hinge-line 48 mm.

This species differs from *P. Chemungensis* in being shorter, proportionally more extended on the hinge-line, with wider ligamental area, more distinct radii, and greatly different proportions of length and breadth, as shown in the right valves.

Formation and localities. In the Chemung group at Buck's quarry and Chemung, Chemung county, and Smithboro, Tioga county, N. Y.

PTERINA RIGIDA.

Pterinea rigida, HALL. Pal. N.Y., vol. v. pt. 1. Plates and Explanations: Pl. 16, figs. 5, 6. Jan. 1883.

SHELL of medium size, sub-rhomboidal, erect; body ovate, narrow above; length somewhat less than the height; margins regularly rounded, slightly extended on the post-basal portion and straight along the posterior side. Left valve moderately convex above, depressed-convex below. Right valve unknown. Hinge-line straight; length about equal to the length of the valve. Beak acute, prominent, directed forward, rising to the hinge-margin. Umbonal region elevated, subtending an acute angle. Ear small, limited by the moderate byssal sinus and broad sulcus. Wing large, broad-triangular, undefined; margin slightly concave; extremity angular.

Surface marked with about thirty slender, rigid, rounded rays, which are sometimes flat or grooved along the summit, continuous from the upper part of the umbo; with wider flat interspaces which sometimes show a fine intermediate ray coming in below the umbo. The cardinal expansions are marked by rays of the same character. Lines of growth cross the surface.

A medium sized specimen has a length of 31 mm., height 34 mm., hinge-line about 35 mm. A smaller specimen is 26 mm. in length, 25 mm. in height, hinge-line 24 mm.

This species bears a general resemblance to *P. Chemungensis*; it differs in its continuous and comparatively stronger rigid radii. The group of four species, beginning with *P. Chemungensis*, is well marked and have many characters in common; but nevertheless, present differences which warrant their specific separation.

Formation and localities. In the Chemung group, at several localities in Chemung county, N. Y.

PTERINEA PRORA.

Pterinea prora, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 16, figs. 4, 13, 14. Jan., 1883.

SHELL of medium size or larger, sub-rhomboidal, oblique; body ovate, narrow above; length one-fourth greater than the height; margins regularly rounded, extended on the post-basal portion and sloping rapidly into the sinus of the wing. Left valve moderately convex. Right valve depressed-convex above, flat or concave below, apparently smaller than the left. Hinge-line straight, longer than the length of the valve, and extending beyond both margins. Beak small, acute, directed forward, situated at about the anterior fifth of the hinge. Umbonal region undefined, not prominent. Ear about one-fifth the length of the wing, separated from the body of the valve by a shallow, undefined sulcus and marked byssal sinus; margin convex; extremity rounded. Wing large, triangular, extended, defined beyond only by the change in the curvature of its margin from that of the body of the valve; margin deeply concave; extremity acute.

Surface of left valve marked with regular, rounded, sub-equal rays with flat interspaces which are sometimes marked by intermediate rays; crossed by fine, concentric lines of growth. The cardinal expansions of both valves show the same character of radii as the body of the left valve. The right valve has subdued rays in the lower posterior portion; the upper part shows only the concentric markings in regular lamellæ of growth.

One specimen is 34 mm. in length, 28 mm. in height, hinge-line 44 mm. Another is 38 mm. in length, 32 mm., in height, hinge-line about 47 mm.

This species has a resemblance to the left valve of *P. avis;* but the eft valve of the present species has greater convexity, more extended inge-line, and a broad, deep sinuosity in the margin of the wing.

Formation and localities. In the Chemung group at Buck's quarry ear Elmira, and Chemung Upper Narrows, Chemung county, N. Y.

The three following species have the right valves convex, and the eft valve nearly flat or concave, being the reverse in this respect of he preceding species of the group. The hinge-area is narrow and eeth have not been observed, while the surface markings are peculiar nd characteristic in the three forms here described. For these reaons I have considered it desirable to distinguish them, for the resent, under a sub-generic head.

VERTUMNIA (SUB GENUS).

PTERINEA (VERTUMNIA) REVERSA.

Pterinea reversa, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 24, figs. 6, 12. Jan., 1883.

SHELL large, rhomboid-orbicular; body somewhat oblique; length and height nearly equal; margins regularly rounded, a little more extended on the posterior side. Left valve flat, or slightly concave, except near the umbo. Right valve moderately convex, the greatest convexity about the middle of the height. Hinge-line straight, length equal to the length of the valve, extending anteriorly beyond the margin. Beak of left valve depressed, obtuse, undefined, erect. Beak of right valve low, obtuse, inclined forward. Umbo not distinct in either valve. Ear of the right valve limited by a distinct broad byssal sinus. Wing triangular, undefined.

Surface marked by strong, rounded, simple, continuous radii originating upon the umbo; with wide, flat interspaces, which, in the right valve, show occasionally a finer ray; crossed by regularly arranged, sharp, concentric striæ, which are conspicuous both on the rays and interspaces. The rays are obscure and distant on the upper part of the cardinal expansions.

A large right valve has a length of 50 mm., height 47 mm., hinge-line 55 mm.

This species differs from *P. prora* by its lesser obliquity, the indefiniteness of the cardinal expansions, the convexity of the right valve, and the flat or concave character of the left valve.

Formation and localities. In the Chemung group near Elmira, at the Upper Narrows of Chemung river, N. Y., and in Tioga county, Pa.

PTERINEA (VERTUMNIA) AVIS.

Pterinea reversa var. avis, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations; Pl. 24, figs. 9, 11, 13. Jan., 1883.

SHELL of medium to large size, rhomboidal, oblique; body ovate; length greater than the height; margin moderately rounded in front, becoming full on the posterior side. Left valve depressed-convex above, flat or concave below. Right valve convex; the greatest convexity about the middle of the valve. Hinge-line straight, length greater than the length of the shell, extended anteriorly beyond the margin of the valve. Beak low, obtuse, inclined forward, situated on the anterior third of the hinge-line. Cardinal expansions unequal, triangular, flat; margins concave; extremities mucronate. Ear limited by a broad, shallow sulcus extending from the beak to the rounded byssal sinus. Wing large, undefined.

Surface of both valves marked by about twenty-five strong, rounded, equal rays, reaching from the umbo to the base, with broad, flat interspaces which occasionally show a single fine intermediate ray. The same surface characters extend over both cardinal expansions. The entire surface is marked by fine, regular, sharp, continuous, concentric striæ.

A left valve has a length of 44 mm., height 31 mm., hinge-line 49 mm. A large right valve has a height of 45 mm., length 65 mm., and hinge-line about 65 mm.

This species resembles *P. reversa,* but differs in its comparatively greater obliquity, more extended hinge, and proportionally greater length. It differs from *P. prora* in the flatness of the left valve, the strong rays, the sharp elevated striæ, and the convexity of the right valve.

Formation and locality. In the Chemung group at Buck's quarry, near Elmira, Chemung county, N. Y.

PTERINEA (VERTUMNIA) REPROBA.

Pterinea (Vertumnia) reproba, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body oblique; length somewhat greater than the height; pallial margin regularly rounded, becoming produced behind and extending thence in a nearly direct line to the hinge. Valves depressed-convex, the right valve the more convex; very similar in form and surface markings. Hinge-line straight, length greater than the greatest length of the shell, extended anteriorly considerably beyond the margin of the valve. Beaks obtuse, not prominent, directed forward, anterior to the middle. Umbonal region undefined. Ear defined by a shallow sulcus; margin concave; extremity acute. Byssal sinus moderate, marked in the right valve by a partial reflexion of the margin. Wing large, triangular and undefined; margin nearly straight below, slightly concave toward the extremity, which is acute.

Surface marked by numerous strong, rounded rays, which alternate on the left valve, and duplicate on the right valve. The interspaces are equal to, or greater than, the radii; the rays are finer on the cardinal expansions, and very obscure on the ear and umbonal region or the right valve. Concentric striæ regular, sharp. Ligamental area narrow, and marked by one or two longitudinal furrows. The sharp striæ in their extension over the hinge-margin give the exterior a crenulated appearance.

A left valve has a length of 25 mm., height 22 mm., hinge-line 30 mm. A right valve has a length of 36 mm., height 28 mm., hinge-line 37 mm.

This species differs from *Pterinopecten Vertumnus* by its comparatively longer hinge-line, more extended ear, less distinctly curving, narrower and more abruptly elevated radii on the left valve; and stronger, not undulating, duplicating radii of the right valve. The form and proportions are similar to *Pterinopecten lætus*, but it is a larger and coarser form, with the right valve convex. The geological positions of the two species are quite different. The character of the surface ornamentation distinguishes it from *Pterinea prora* and *Pterinea avis*.

Formation and locality. In shales of the Chemung group, 600 feet above the base of the formation, at Ithaca, N. Y.

ACTINOPTERIA, HALL.

ACTINOPTERIA EXIMIA.

Actinopteria eximia, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, fig. 1. Jan., 1883.

SHELL small, rhomboidal; body falciform, very oblique; length more than one-third greater than the height; margin broadly curved along the ventral side and abruptly recurved over the posterior end. Left valve convex. Right valve unknown. Hinge-line straight, less than the length of the valve. Beak acute, directed forward. Umbonal angle about 60°. Ear short, oblique, limited by a distinct sulcus; margin convex; extremity rounded. Wing imperfectly preserved in the specimen described, apparently joining the body near the middle of the post-cardinal slope, and very strongly defined; margin concave, extending acutely backward; extremity acute.

Test marked by about twenty strong, elevated slender rays, with regular lamellæ of growth which are extended and bent backward on crossing the rays, producing strong semi-tubular spines. The cardinal expansions preserve only the lines of growth.

The specimen described has a length of 20 mm., and height of 14 mm.

The characters of form and surface ornamentation are very characteristic, and the species is important as being the only one of the genus yet found in the Schoharie grit. It differs from *A. muricata* in its narrower and more oblique body and shorter wing, as measured along the post-cardinal slope.

Formation and locality. In the Schoharie grit, at Schoharie, N. Y.

ACTINOPTERIA MURICATA.

Avicula muricata, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 181. 1843.
Pteronites muricatus, HALL. S. A. MILLER. Cat. Amer. Pal. Foss, p. 202. 1877.
Actinopteria muricata, HALL. Pal N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 17, figs. 1–3. Jan., 1883.

SHELL small, sub-rhomboidal; body sub-ovate, very oblique; length one-third greater than the height; margin rounded below, turning abruptly backward on the posterior side, and extending in a direct line to the beak. Left valve convex. Right valve unknown. Hinge-line straight from the beak to the posterior extremity, sloping downward on the anterior side; entire length greater than that of the body of the shell. Beak acute, arching over the hinge, inclined forward, situated at the anterior third of the hinge-line. Umbonal region subtending an acute angle. Ear broad-triangular, separated from the body of the shell by a broad undefined sulcus which is limited by a strong sub-angular fold extending from the beak, and by the deep rounded byssal sinus; margin convex; extremity obtuse. Wing flat, triangular, defined by having more subdued surface rays; margin deeply sinuate; extremity mucronate.

Test thin, marked with from eight to twelve strong filiform rays, with finer intermediate ones in the broad, flat interspaces. The rays on the wing are somewhat subdued. Surface crossed by fine concentric lines of growth, which, at intervals, are crowded and raised into lamellæ, and on the rays are produced into tubular spines. These spines are seen only in the better preserved specimens, and appear in the casts as elongate elevations upon the rays. The concentric striæ are conspicuous in the anterior sulcus. Ligamental area grooved.

The largest specimen has an entire length of 16 mm., height 10 mm., hinge-line, to the imperfect posterior extremity, 12 mm. A smaller specimen has an entire length of 14 mm., height 9 mm., hinge-line 15 mm. The smallest specimen measures 10 mm. in length of body and hinge-line, and 6 mm. in height.

In form and surface characters this species is quite unlike any other described from these rocks. In some respects it resembles *A. eximia*, but has more extended wing and less elongate body.

Formation and locality. In the Marcellus shale at Littleville near West Avon, Livingston county, N. Y.

ACTINOPTERIA DORIS.

Actinopteria Leander, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 17. fig. 4. Jan., 1883.

Actinopteria Doris, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished*.

SHELL small, sub-rhomboidal; body obliquely sub-ovate; length a little greater than the height; margins regularly rounded, sloping abruptly from the upper part of the posterior side to the beak. Left valve depressed-convex. Right valve unknown. Hinge-line straight, about equal to the length of the shell (imperfect in the specimen described). Beak depressed, inclined forward, situated at the anterior third of the hinge. Umbonal region not defined, subtending an acute angle. Ear not observed. Wing large, flat, not distinctly defined; margin concave; extremity acute.

Test thin, marked by regular, equal, rounded radii, with wider flat interspaces, and sometimes with obscure intermediate rays. The wing shows finer rays, somewhat crowded at its junction with the body. The fine, concentric lines of growth are stronger on the anterior of the valve, giving a cancellate aspect to the surface. Ligamental area with one or two longitudinal grooves.

The specimen has a length of 18 mm., height 16 mm.

Formation and locality. In the Marcellus shale at East Bloomfield, Ontario county, N. Y.

ACTINOPTERIA SUBDECUSSATA.

Pteronites subdecussata, HALL. MS., vol. v. 1877.

" " " S. A. MILLER. Cat. Amer. Pal. Foss., p. 202. 1877.

Actinopteria subdecussata, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 17, figs. 23, 25–27, 29–31; pl. 19, fig. 25. Jan., 1883.

SHELL large, sub-rhomboidal, very oblique; body elongate sub-ovate; height about one-third less than the length; margins regularly curved, becoming more extended on the posterior side. The left valve, in old specimens, has the umbo convex above, depressed-convex or flat below, while in young specimens the umbo is altogether convex or gibbous. Right valve moderately convex near the umbo, flat or concave below the middle. Hinge-line straight, length about one-fifth less than the length of the shell, not extending as far as the posterior margin of the left valve, but extending beyond the posterior margin of the right valve. Beak acute, directed forward, somewhat prominent, anterior, nearly terminal. Umbonal region (in young shells) well-marked by the sulci; umbonal angle acute. Ear very small, separated by a vertical sulcus. Wing large, triangular, defined in young shells by the abrupt convexity of the post-cardinal slope; in old specimens not distinctly defined; margin concave; extremity acute. The wing of the right valve is larger, and extends beyond the margin of the shell.

Test comparatively thin, marked with regular, sub-angular, alternating radii, the stronger ones extending from the summit of the umbo; a second set intercalated on the lower part of the umbo, and a third set of smaller rays coming in toward the margin. The first and second series only are shown in young shells. In the right valve the radii are more subdued. The rays extend over the cardinal expansions of both valves in nearly uniform size. Concentric, elevated, regularly rounded striæ of growth cross the rays, and cancellate the surface, and at intervals are crowded together, giving it a lamellose aspect. Ligamental area marked by one or two parallel grooves.

A large specimen has a length of 65 mm., height 47 mm., hinge-line 55 mm. A specimen of medium size has a length of 51 mm., height 35 mm., hinge-line 41 mm. A smaller example has a length of 18 mm., height 11 mm., hinge-line 13 mm.

This species is similar in form to *A. decussata*, but differs in the convexity of the valves and the less strongly decussated character of the ornamentation, the rays being continuous and annulated by the concentric striæ, while in that species the rays are interrupted by strong concentric lamellæ, between which are the finer lines of growth. This species is also less abundant and more restricted in geographical range.

Formation and locality. In the shales of the Hamilton group on the shores of Canandaigua lake, and near Bellona, Yates county, N. Y.

ACTINOPTERIA DECUSSATA.

Avicula decussata, HALL. Geolog. Surv. N. Y. Rep. Fourth Dist., p. 203. 1843.
Pteronites decussata, HALL. S. A. MILLER. Cat. Amer. Pal. Foss., p. 202. 1877.
Actinopteria decussata, HALL. Pal. N. Y, vol. v, pt. 1. Plates and Explanations: Pl. 17, figs. 24, 28; pl. 18, figs. 1–15. Jan., 1883.

SHELL large, sub-rhomboidal; body sub-ovate, very oblique; length about one-fourth greater than the height; margins regularly curving; the anterior margin sometimes nearly vertical; posterior margin more abruptly rounded. Valves convex; the right valve less convex and smaller than the left valve. Hinge-line straight, less than the length of the valve. Beak acute, prominent, inclined forward, situated close to the anterior end of the shell. Umbonal region prominent, and in the left valve gibbous; subtending an acute angle. Ear small, separated from the valve by a broad sulcus, beyond which it is a mere fold in the shell. Wing large, triangular, flat, extending nearly to the margin of the valve; limited, in the left valve, by a more or less distinct sulcus, and the abrupt bending of the concentric striæ; margin concave; extremity acute. This character of the wing is somewhat less marked in the right valve.

Test thick: the left valve marked with strong, prominent, rounded radii, regularly alternating with finer ones on the posterior half of the valve; crossed at regular intervals by strong concentric lamellæ; the interspaces marked by fine lines of growth. From maceration or exfoliation these surface characters are usually only partially preserved, or nearly obsolete. In certain conditions the rays become nodose where crossed by the lamellæ, and in many examples the concentric striæ interrupt the rays, leaving them alternating above and below the lamellæ. The surface characters of the body are continued on the wing, while on the ear the concentric striæ are crowded and conspicuous, and the rays obsolete. In the right valve the markings are much subdued, the rays often obsolete, especially on the lower part of the valve, and the concentrie lamellæ are simple undulations of the surface. Ligamental area narrow, linear; marked, apparently, by a single groove. The cast shows a fold corresponding to the sulcus limiting the wing. Pallial line extending from just anterior and below the umbo to the posterior portion of the body and thence recurving, terminating in a small oval muscular impression. No evidences of teeth are seen in the casts or the interior of valves.

A large specimen has a length of 76 mm., height 56 mm., hinge-line 62 mm. A medium-sized example has a length of 52 mm., height 43 mm., hinge-line 42 mm.

This form differs from *A. subdecussata* in the greater and nearly equal convexity of the valves, the stronger, rounded rays, and their interruption by the concentric lamellæ.

Formation and localities. In the Hamilton group, at numerous places in Central and Western New York.

ACTINOPTERIA BOYDI.

Avicula Boydii, CONRAD. Jour. Acad Nat. Sci., Phila., vol. viii, p. 237, pl. 12, fig. 4. 1842

Pterinea Boydii, CONRAD. S. A. MILLER. Cat. Amer. Pal. Foss., p. 201. 1877.

Avicula quadrula, CONRAD. Jour. Acad. Nat. Sci., Phila., vol. viii, p. 243, pl. 13, fig. 5. 1842.

Actinopteria Boydii, HALL Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 19, figs. 2-24, 26-30; pl. 23, figs. 5, 6. Jan., 1883.

Compare *Avicula perobliqua*, CONRAD. Jour. Acad Nat. Sci., Phila., vol. viii, p. 235, pl. 12, fig. 1. 1842.

Compare *Avicula pleuroptera*, CONRAD. Jour. Acad. Nat. Sci., Phila., vol. viii, p. 242, pl. 13, fig. 2. 1842.

SHELL of medium size, rhomboidal; body ovate, varying in proportions, the longitudinal axis at an angle with the hinge-line of from 45° to 60°; length varying from nearly equal to one-fourth greater than the height; margins regularly rounded below, straight and nearly vertical for a short distance in front; post-basal side extended. Valves convex, the right valve a little less convex than the left. Hinge-line straight from the anterior side of the beak to the posterior extremity. Beak anterior, acute, prominent, inclined forward, rising above the hinge in the left valve. Umbonal region prominent, subtending an acute angle. Ear short, oblique, limited by a deep but not sharply defined sulcus. Wing large, triangular, not distinctly separated from the body of the shell; margin concave; extremity acute. In the right valve the ear is somewhat more extended, the sulcus not strong, but the byssal sinus is marked; the wing is proportionally larger and usually more acute at the extremity.

Test thick; the left valve, in well-preserved specimens, is marked by numerous strong, simple, sharp rays, which are continuous from the umbo to the margin, with rarely intercalated finer rays; crossed by regular, sharp, elevated, concentric lamellæ which (in good specimens) are produced into subtubular, spiniform extensions upon the rays. Lines of growth are seen between the lamellæ. On the wing the rays are more subdued, while the concentric lamellæ are strong. The ear is marked only by the crowded concentric striæ. On the right valve the radii are obsolete on the body and well-marked on the wing, and the lamellose expansions are conspicuous. In some casts they appear as undulating elevated lamellæ.

Pallial line extending parallel to the margin of the shell and terminating in a muscular impression on the posterior slope. A small muscular impression is also seen just in front of the beak, and obscure indications of one or two lateral teeth. Ligamental area narrow, striated, marked by two or three slender grooves, which are slightly divergent from the hinge-line.

One of the original specimens of *A. quadrula* (=*A. Boydi*) has a length of 30 mm., height and hinge-line each 28 mm. A similar specimen has a length of 25 mm., height and hinge-line each 23 mm. Two large specimens belonging to the group of *A. Boydi* have the following respective dimensions: length 38 and 40 mm., height 38 and 35 mm., hinge-line 34 and 30 mm.

This species, in older specimens, resembles *A. subdecussata*, but differs in the character of the rays, in the less obliquity, and the wider body. The left valve somewhat resembles the right valve of *Avicula reticulata*, Hisinger, but a comparison of the right valves of both species shows them to be different. The forms here classed under one specific designation were described by Mr. Conrad under different species, viz.: *Avicula Boydii*, *A. quadrula*, *A. pleuroptera*, and probably *A. perobliqua*.

The species in its various stages of growth and state of preservation presents a great variation in form and surface characters. The usual condition is that of casts of the interior or specimens more or less exfoliated, leaving the surface markings subdued or obsolescent, and in a few specimens only, have the entire characters of the test in either or both valves been observed. The older specimens show an extension of the shell along the post-basal margin which is marked by concentric striæ and undulations, while the rays become interrupted and obsolete. After a study and comparison of a very large number of individuals, it has not been found possible to draw any satisfactory line of specific distinction.

Formation and localities. In the shales of the Hamilton group; abundant at numerous places in the eastern and central portions of the State.

ACTINOPTERIA PEROBLIQUA.

Avicula perobliqua, CONRAD. Jour Acad. Nat. Sci., Phila., vol. viii, p. 235, pl. 12, fig. 1. 1842.

Actinopteria perobliqua (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 19, fig. 31. Jan., 1883.

SHELL of medium size, sub-rhomboidal; body very oblique, narrow-ovate; length one-third greater than the height; anterior margin truncate or slightly concave; basal margin regularly arched and acutely rounded over the post-basal side. Valves very convex. Left valve gibbous in the upper part, angular along the post-cardinal slope. Right valve somewhat less convex. Hinge-line straight, about two-thirds the length of the shell. Beak anterior, acute, prominent, inclined forward. Umbonal region gibbous, subtending at an acute angle. Ear a small lobe, defined by a distinct sulcus and shallow, elongate, byssal sinus. Wing large, triangular, limited by the angular post-cardinal slope of the valves; margin moderately concave, sloping forward; extremity angular.

Test (as seen in the specimen, which is a partial cast of the interior) marked by irregular concentric striæ, which become fasciculate on the wing; the surface apparently without rays. Muscular impression large, sub-quadrangular, below the middle of the post-cardinal slope, from which the pallial line, curving downward below the middle of the valve, extends parallel with the margin to the anterior side of the umbo.

The specimen described has a length of 37 mm., height 24 mm., hinge-line 27 mm.

This specimen occurs associated with *A. Boydi* and other allied forms, and is known by the convexity of the valves, the sub-angular character of the posterior slope of the left valve, the great obliquity, the proportions of length and height, and the absence of radii in the cast.

Formation and locality. In the shales of the Hamilton group, Cazenovia, Madison county, N. Y.

ACTINOPTERIA PUSILLA.

Actinopteria pusilla, HALL. Pal. N. Y., vol. v. pt. 1. *Unpublished.*

SHELL small, sub-rhomboidal; body ovate, very oblique; length and height nearly equal; margin for a short distance on the anterior side nearly vertical, broadly rounded along the base and produced on the posterior side. Right valve convex on the umbo, becoming depressed below the middle of the length. Left valve unknown. Hinge-line straight, less than the length of the shell. Beak anterior, acute, moderately prominent. Umbonal region scarcely gibbous, subtending an acute angle. Wing narrow, triangular, elongate, extending nearly to the posterior end of the shell; margin concave; extremity abruptly acute.

Test thin, marked by elevated, sub-imbricating concentric bands, produced by the lamellose character of the striæ. Crossing these bands, on the posterior half of the shell, are interrupted radiating lines, which indicate the presence of radii upon the original surface. The wing is marked in a similar manner by strong bands, which pass over the hinge-margin, and it also shows two or three interrupted radiating lines, like those on the posterior part of the body of the shell.

The specimen described has a length of 11 mm., height 13 mm., and hinge-line 10 mm.

This species is allied to *A. decussata* and *A. Boydi*, having the wing characteristic of the former; but it is a proportionally shorter form, and the surface markings are quite unlike the right valve of any of the forms at present known.

Formation and locality. In shales of the Hamilton group, on the shores of Canandaigua lake, N. Y.

ACTINOPTERIA PERSTRIALIS.

Actinopteria perstrialis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 2, 7. Jan., 1883.

SHELL small, sub-rhomboidal; body sub-ovate, axis slightly curved and oblique at an angle of about 45° with the hinge; height about three-fourths the length of the body; basal margin broadly rounded; posterior margin abruptly curved. Left valve regularly convex, moderately gibbous at the umbo. Right valve depressed-convex below, more convex above. Hinge-line straight, length equal to the length of the body. Beaks sub-anterior, in the left valve prominent and rising above the hinge; in the right valve the beak extends to the hinge-line. Umbonal region moderately gibbous in the left valve, convex in the right, subtending nearly a right angle. Ear short, separated from the body by a marked byssal depression; extremity rounded. Wing narrow, triangular, joining the body midway between the beak and the posterior extremity, not distinctly defined; margin concave; extremity produced and acute. The right valve is less distinctly auriculate in front; the anterior extremity acute; the wing is larger and the margin less abruptly concave.

Test thin, marked by fine concentric striæ which are more conspicuous and equi-distant on the right valve. The left valve is marked with fine, closely arranged radii, which are strongest on the upper margin of the wing. The body of the right valve shows only sharp, distinct, concentric striæ; the wing is marked by a few rays in the lower part, and by stronger radii along the hinge-line, which are cancellated by the concentric striæ. The auricle is radiated, and cancellated in the same manner.

A left valve has a length of 13 mm., height 10 mm., and hinge-line 12 mm. A large right valve has a length of 15 mm., height 12 mm., and hinge-line 15 mm.

This species differs from *A. tenuistriata* in its more oblique body, comparatively longer hinge-line, and more closely arranged and stronger radii.

Formation and locality. In the lower part of the Chemung group, near Ithaca, N. Y.

ACTINOPTERIA TENUISTRIATA.

Actinopteria tenuistriata, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL small, sub-quadrate ; body short ovate, oblique at an angle of 60° with the hinge-line ; length about one-fifth greater than the height ; anterior margin below the sinus nearly vertical, and then making a broad curve along the base ; posterior margin broadly curved. Left valve regularly convex below the middle, gibbous on the umbo. Right valve smaller, nearly equally convex. Hinge-line straight, a little greater than the height of the valve. Beaks at about the anterior third of the hinge-line prominent, obtuse, rising above the hinge. Umbonal region gibbous and ample, subtending nearly a right angle. Ear small, defined by a distinct sinus and byssal depression, rounded at the extremity. Wing small, triangular, joining the body below the middle of its length, not strongly limited ; margin gently concave ; extremity acute.

Test thin, marked by fine concentric striæ, and filiform radiations with wider interspaces, which are marked by extremely slender intermediate striæ. On the anterior side the radiating lines are finer, and on the cardinal margin of the wing they are stronger. The right valve is marked only by elevated concentric striæ, and the wing by fine radiations, which become stronger toward the cardinal margin.

One specimen has a length of 16 mm., height 13 mm., and hinge-line 14 mm.

This species is distinguished from *A. perstrialis* by its erect and more nearly quadrate form, shorter ear, less extended wing with less concave margin, and more distinct, finer striæ.

Formation and locality. In the lower part of the Chemung group at Ithaca, N. Y.

ACTINOPTERIA AURICULATA.

Actinopteria auriculata, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL small, rhomboidal; body ovate, oblique at an angle of more than 45° with the hinge-line; length about one-fifth greater than the height; anterior margin rounded to the sinus; base gently curved; posterior margin abruptly recurved. Left valve regularly convex below, gibbous above. Right valve unknown. Hinge-line straight, greater than the height of the valve. Beak anterior to the middle of the hinge-line, acute, prominent, arching over the hinge. Umbonal region abruptly gibbous, subtending an acute angle. Ear large, straight above, limited by an abrupt vertical byssal depression; extremity rounded. Wing small, not strongly defined, joining the body two-thirds of its length below the beak; margin concave; extremity produced.

Test marked by concentric striæ, and about twenty somewhat strong, sharp radii; this ornamentation is also continued on the wing and the ear.

The specimen is 10 mm. in length, 6 mm. in height, hinge-line 7 mm.

This species resembles *A. perstrialis* in form, but differs in the larger ear, abrupt vertical byssal depression, shorter wing and coarser radii.

Formation and locality. In the Chemung group at Lawrenceville, Tioga county, Pa.

ACTINOPTERIA DELTA.

Actinopteria delta, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23. fig 3. Jan., 1883.

SHELL of medium size, rhomboidal; body broad-ovate, oblique at an angle of about 60°; height less than three-fifths the length; anterior margin rounded, curving into a defined sinus; base broadly curved; post-basal side abruptly rounded. Left valve gibbous above, gently convex below. Right valve unknown. Hinge-line straight, about equal to the height of the valve. Beak at about the anterior third of the hinge, directed forward, prominent, rising above the cardinal line. Umbonal region gibbous, nearly rectangular. Ear rounded, defined by a distinct byssal depression which extends forward from the beak. Wing small, joining the body near the posterior extremity, not strongly defined; margin gently concave; extremity produced.

Test marked by fine concentric striæ, and undulating or interrupted filiform radiations, with wider interspaces, which have probably been marked by finer intermediate striæ. The concentric lines are obscure in the cast and appear as a few irregular concentric undulations.

The specimen is 23 mm. in length, 15 mm. in height, hinge-line 16 mm.

Formation and locality. In the lower part of the Chemung group at Ithaca, N. Y.

ACTINOPTERIA EPSILON.

Actinopteria epsilon, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 4, 8. Jan., 1883.

SHELL of medium size, rhomboidal; body ovate, oblique to the axis at an angle of about 60°; height about three-fourths the length; anterior margin rounded into a very abrupt sinus; base broadly curved; post-basal side abruptly rounded. Left valve moderately convex. Right valve depressed-convex above, flat or concave below. Hinge-line straight, length somewhat less than the height of the valve. Beaks anterior, acute in the left valve; prominent and elevated above the hinge. Umbonal region gibbous, subtending an angle of less than 60°. Ear short, defined by a deep, abrupt byssal depression. Wing triangular, joining the body below the middle, not strongly defined; margin regularly concave; extremity acute and produced.

Test thin, in the left valve marked by somewhat distant, elevated, lamellose, concentric striæ, with intermediate finer lines, and by abruptly elevated rounded rays with wider interspaces; these are cancellated by the concentric striæ, which are more conspicuous on the wing. In the right valve the radiating striæ are subdued, and the concentric striæ become more conspicuous.

A specimen of the left valve is 21 mm. in length, 16 mm. in height, and hinge-line 14 mm.

This species differs from *A. delta* by its narrower form and greater obliquity of body.

Formation and locality. In the lower part of the Chemung group at Ithaca, N. Y.

ACTINOPTERIA ZETA.

Actinopteria zeta, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 23, fig. 9. Jan., 1883.

SHELL large, rhomboid-orbicular; body broadly ovate, nearly erect; height greater than the length; auricular margin rounded into the byssal sinus; below the sinus the margin is nearly vertical and gradually joining the broad basal curvature; posterior end regularly rounded. Left valve gently convex below, moderately gibbous above. Right valve flat or concave below, depressed-convex above. Hinge-line straight, much longer than the greatest length of the valve. Beak in the left valve sub-anterior, elevated, curving over the hinge; in the right valve depressed, not rising above the hinge-line. Umbonal region subtending nearly a right angle. Ear small, rounded at the extremity, defined by a strongly marked byssal depression. Wing large, joining the body below the middle, not strongly defined; margin deeply concave in the middle; extremity produced into an acute extension.

Surface marked by strong, elevated, regular, distant, lamelliform, concentric striæ, with intermediate finer lines, and by slender, filiform, undulating, distant rays, which are more crowded on the anterior side, becoming finer and more numerous at the junction of the wing with the body, and a few much stronger ones along the cardinal line. Rays not present on the ear, which is marked only by the crowded concentric striæ. The concentric striæ crenulate the rays and bend backward in the interspaces, producing a beautifully cancellated surface. The right valve shows two oblique lateral folds or teeth posterior to the beak.

A right valve has a length of 25 mm. parallel to the hinge, height 28 mm., hinge-line about 34 mm. An imperfect left valve has an approximate length of 22 mm., height 24 mm., and hinge-line 33 mm.

This species is distinguished by its erect, orbicular form, great extension of hinge-line, and marked surface characters.

Formation and locality. In the lower part of the Chemung group, at Ithaca, N. Y.

ACTINOPTERIA ETA.

Actinopteria eta, Hall. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body broad and short-ovate, oblique at an angle of about 45°; length about one-fourth greater than the height; anterior margin below the sinus nearly vertical, curving gradually into the broad base; posterior side regularly rounded. Left valve regularly convex below, moderately gibbous above. Right valve smaller, depressed-convex below, gently convex above. Hinge-line straight, length greater than the height of the shell. Beak in the left valve sub-anterior, prominent, arching over the hinge; in the right valve subdued, scarcely rising above the hinge-line. Umbonal region gibbous in the left valve, subtending an acute angle. Ear in the left valve rounded at the extremity, slightly oblique, defined by a distinct byssal depression. In the right valve the ear is larger and flat, strongly limited. Wing comparatively large, extending three-fourths the length of the valve, not strongly defined; margin concave; extremity produced and acute. In the right valve the wing is larger, extending almost as far as the posterior side of the valve.

Surface of left valve marked by distant, lamellose, concentric striæ and by radiations with wider interspaces which have sometimes slender intercalated rays. The concentric lamellæ crenulate the radii, and are arched backward in the interspaces, producing a beautifully cancellated surface. The finer concentric striæ between the lamellæ are rarely visible, and the spaces between the rays show, under a lens and in well-preserved examples, extremely fine, crowded radiations. The radii are also seen in the depression limiting the ear, and on the wing they are equal to those on the body of the valve. The right valve is marked by regular, equi-distant, concentric lamellæ. The posterior slope and wing show numerous fine radii which are crossed by concentric striæ continued from the lamellæ on the body of the valve.

A small specimen is 20 mm. long, 14 mm. high, and hinge-line 16 mm. A larger imperfect example has, approximately, a length of 30 mm., height 22 mm., and hinge-line 24 mm.

In surface characters this species resembles *A. zeta,* but is distinguished by its greater obliquity, and much smaller wing.

Formation and locality. In the lower part of the Chemung group at Ithaca, N. Y.

ACTINOPTERIA THETA.

Actinopteria theta, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, sub-rhomboidal; body broadly ovate, oblique at an angle of about 55°; length about one-fourth greater than the height; anterior margin, below the ear, nearly vertical, curving into the broad base; posterior end regularly rounded. Left valve moderately convex, depressed below. Right valve smaller and less convex, nearly flat below. Hinge-line straight, length nearly equal to the height of the shell. Beaks sub-anterior, prominent, arching over the hinge-line in the left valve. Umbonal region moderately gibbous in the left valve, subtending an acute angle. Ear rounded, a little oblique, defined by a nearly vertical depression. In the right valve the ear is flat or concave, limited by the abrupt elevation of the umbo. Wings large, in the left valve extending about three-fourths the length of the body, and in the right valve joining the body at the posterior end, without distinct limitation in either valve; margin moderately concave; extremity slightly produced, angular.

Surface of left valve marked by sharp, elevated, lamellose, concentric striæ, with intermediate finer lines; and by slender, elevated rays, with wider interspaces between the primary rays, which are often occupied with one or two finer lines; the ear and wing are marked in a similar manner. The rays are distinctly crenulated and the interspaces are cancellated by the concentric lines, which are slightly curved backward. The surface of the right valve is marked by strong, lamellose, concentric striæ, which become less conspicuous on the wing. The posterior slope of the body and the wing of this valve are marked by numerous fine rays.

A specimen with the two valves attached has approximately a length of 48 mm., height 30 mm., and hinge-line 33 mm.

This species resembles *A. eta*, but differs in the more extended wing, finer radii of the left valve, with interstitial additions, narrower interspaces, and more numerous concentric lamellæ.

Formation and locality. In the shales of the lower part of the Chemung group at Ithaca, N. Y.

ACTINOPTERIA IOTA.

Actinopteria iota, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body broadly ovate, oblique at an angle of about 45°; length about one-seventh greater than the height; anterior margin nearly vertical or slightly inclined for a short distance, thence curving into the broad base; posterior end broadly rounded. Left valve depressed below, regularly convex above, scarcely gibbous. Right valve unknown. Hinge-line straight, about equal to the length of the shell. Beak sub-anterior, prominent. Umbo moderately gibbous, subtending an acute angle. Ear comparatively short, defined by a distinct byssal depression, rounded at the extremity. Wing not strongly limited, extending quite as far as the posterior extremity of the shell; margin somewhat deeply concave in the middle; extremity produced and acute.

Surface marked by concentric lamellose striæ, and fine thread-like rays, which are crenulated and cancellated by the lines of growth both on the body and on the wing.

One of the specimens is 30 mm. in length, 22 mm. in height, and hinge-line about 30 mm.

This form resembles *A. theta*, but the body is proportionally shorter, the hinge-line longer, the wing margin more concave and the extremity more produced.

Formation and locality. In the lower part of the Chemung group at Ithaca, N. Y.

ACTINOPTERIA KAPPA.

Actinopteria kappa, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body narrowly ovate, oblique at an angle of less than 45°; length one-third greater than the height; anterior margin oblique, rounded into the broadly curved basal margin; posterior end abruptly rounded. Left valve depressed below, convex from the middle upward. Right valve unknown. Hinge-line straight, equal to the height of the valve. Beak sub-anterior, prominent, arching over the hinge-line. Umbonal region moderately gibbous. Ear short, oblique, rounded anteriorly, defined by a distinct byssal depression. Wing triangular, joining the body nearly two-thirds of the length from the beak; margin oblique, concave; extremity produced, acute.

Test thin, marked by fine, concentric, irregularly fasciculating striæ, giving an undulated appearance to the surface, and by filiform, interrupted and undulating radii, with wider interspaces, which sometimes show fine intercalated rays. The radii upon the wings are prominent and cancellated by the concentric striæ, and are obsolete upon the ear.

The specimen has a length of 30 mm., height 20 mm., and hinge-line 20 mm.

This species differs from *A. epsilon*, in the greater obliquity, longer hinge-line, and more distant radii.

Formation and locality. In the lower member of the Chemung group at Ithaca, N. Y.

PTYCHOPTERIA, HALL.

PTYCHOPTERIA PROTO.

Ptychopteria Proto, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 12, 14. Jan., 1883.

SHELL small, rhomboidal; body narrow-ovate, oblique at an angle of about 35° with the hinge-line; length more than one-third greater than the height; ante-byssal margin sub-truncate, rounding into the broad sinus; base broadly rounded; posterior end somewhat abruptly curved. Left valve regularly convex below, gibbous in the middle and above. Right valve unknown. Hinge-line straight, length a little greater than the height of the valve, and nearly equal to two-thirds its length. Beak at about the anterior third of the hinge, prominent, inclined forward. Umbo abruptly gibbous, subtending an acute angle. Anterior end large,* rounded, limited by a broad byssal depression directed backward; extremity angular. Wing small, narrow-triangular, extending to near the posterior end of the body; margin scarcely concave; extremity obtuse.

Surface marked by fine, regular, elevated radii, which are less conspicuous on the wing; also by concentric striæ, which are often crowded and lamellose, producing a somewhat undulated character of the surface.

A large left valve has a length of 29 mm., height 18 mm., and hinge-line 20 mm. A smaller specimen has a length of 20 mm., height 13 mm., and hinge-line 14 mm.

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*In the descriptions of the species of Ptychopteria and Leptodesma, the term "auricle" or "ear" is not so applicable to the anterior extension as Actinopteria and Leiopteria and the term "anterior end" has been used for that portion of the shell anterior to the byssal sinus.

This species resembles *P. sinuosa,* but the anterior end is wider; the wing is smaller and not produced at the extremity, and the radii are coarser. These two species are distinguished from the forms which follow by the large anterior end which is separated from the body by a broad byssal depression.

Formation and localities. In a coarse sandstone, from a bowlder containing the same associated fossils as a sandstone at Portville, Cattaraugus county, N. Y.; probably of the Upper Chemung group, Smethport, McKean county, Pa.

PTYCHOPTERIA SINUOSA.

Ptychopteria sinuosa, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, fig. 13. Jan., 1883.

SHELL of medium size, rhomboidal; body narrow-ovate, oblique at an angle of about 40° with the hinge-line; length more than one-third greater than the height; ante-byssal margin nearly vertical, curving into the broad sinus; base broadly rounded; posterior margin recurving into the wing. Left valve convex below, gibbous in the middle and above. Right valve unknown. Hinge-line straight, length four-fifths the length of the shell. Beak at about the anterior third of the hinge, acute, directed forward. Umbonal region strongly gibbous, limited by the abrupt depression of the body on the posterior side, and by the byssal depression on the anterior side. Umbonal angle about 30°. Anterior end large, narrow, rounded, defined by a broad, shallow, nearly vertical byssal depression; extremity angular. Wing narrow-triangular, extending nearly to the posterior extremity of the body; margin nearly vertical, slightly concave; extremity somewhat produced, angular.

Surface marked by fine undulating radii, which are less conspicuous on the wing, and by fine concentric lines of growth, which are crowded into sub-imbricating lamellæ. On the anterior side of the body the rays are cancellated by the elevated concentric striæ. The ligamental area shows a sharp linear groove extending three-fourths of its length posterior to the beak, and a narrow cardinal tooth anterior to the beak and parallel to the hinge.

A large specimen of the left valve has a length of 31 mm., height 19 mm., and hinge-line 25 mm. A smaller one has a length of 24 mm., height 13 mm., hinge-line 20 mm.

This species has a narrower anterior end than the preceding, a larger and more extended wing, finer and undulating striæ.

Formation and localities. In sandstones of the Upper Chemung group, Smethport, McKean county, and at Warren, Warren county, Pa., associated with *Spirifera Verneuili.*

PTYCHOPTERIA SALAMANCA.

Ptychopteria Salamanca, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 17–20. Jan., 1883.

SHELL large, rhomboidal; body sub-ovate, oblique at an angle of about 40° with the hinge-line; length more than once and a half the height; ante-byssal margin oblique, rounded below, slightly concave at the sinus, and sloping to the broadly rounded base, thence abruptly recurved and continued almost vertically into the margin of the wing. Valves convex, gibbous above the middle. The left valve is more gibbous than the right and somewhat larger. Hinge-line straight, length more than three-fourths the length of the shell. Beaks in front of the anterior third of the cardinal line, directed forward: the left beak prominent, acute, arching over the hinge; the right beak obtuse, depressed, scarcely rising above the hinge-line. Umbonal region gibbous, subtending an acute angle. The umbo and beak of the left valve are much more prominent, and the post-cardinal slope is obtusely sub-angular. Anterior end comparatively small, triangular, produced into an acute extension. Wing large, triangular; margin gently concave; extremity produced, acute. The fold and sulcus are more conspicuous in the right valve.

Surface marked by fine, regular, undulating and interrupted radii, which are more conspicuous on the wing; crossing these are regular concentric lines, which are irregularly crowded into sub-imbricating lamellæ. On the anterior end of the valve the radii are cancellated by the concentric striæ. Interior characters unknown, except a narrow groove along the ligamental area.

A left valve has a length of 41 mm., height 24 mm., hinge-line 32 mm. A similar right valve has a length of 40 mm., height 24 mm., hinge-line 34 mm.

This species varies in different conditions of preservation. The obtusely sub-angular appearance of the posterior slope is often exaggerated by lateral pressure or subdued by vertical pressure. The same is true of the folds of the wing. In some conditions the radiations are continuous, in others they are cancellated. In weathered specimens the striæ are sometimes nearly obsolete, and the concentric lamellæ more prominent.

Formation and locality. In the Chemung group, in a sandstone above the conglomerate at Rock City, near Salamanca, N. Y.

PTYCHOPTERIA SAO.

Ptychopteria Sao, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 16, 23. Jan., 1883.

SHELL of medium size, rhomboidal; body narrow, elongate-ovate, oblique at an angle of about 45° with the hinge-line; length one-third greater than the height; ante-byssal margin obliquely sub-truncate, gently curving into the sinus; base broadly rounded; posterior margin extended, abruptly recurved to the wing. Valves convex; left valve larger and more convex than the right. Hinge-line straight, longer than the height of the valve. Beak in front of the anterior third of the cardinal line, obtuse, prominent in the left valve and arching over the hinge; less prominent in the right valve, and rising just above the hinge. Umbo gibbous in the left valve, less gibbous in the right, subtending an acute angle. Anterior end short, small, acute, limited by a shallow byssal depression. Wing large, triangular, extending to near the posterior extremity of the body; margin slightly oblique, scarcely concave; extremity apparently not produced.

Surface marked by fine radii which are more or less interrupted by the varices of the concentric striæ, and are frequently undulating. The concentric striæ are often fasciculate, and in their usual condition give an undulated appearance to the cast, but where well-preserved they are angular and somewhat lamellose. Interior unknown, except a narrow groove along the ligamental area of the hinge.

A left valve of usual dimensions has a length of 30 mm., height 19 mm., hinge-line 23 mm. A similar right valve has a length of 31 mm., height 18 mm., and hinge-line 22 mm.

This species differs from *P. Proto* in its less angular posterior slope and posterior end; the margin of the wing is less oblique to the hinge-line and the extremity is not produced. The specimens occurring in a conglomerate or coarse sandstone have been subjected to different degrees of pressure and maceration, and consequently present a great variety of aspect in the surface ornamentation. The furrow and fold limiting the wing are always less conspicuous in the left valve; and in some cases when the shell has suffered pressure these characters are very obscure.

Formation and locality. Abundant in a conglomerate of the Chemung group at Panama, Chautauqua county, N. Y.

PTYCHOPTERIA EUCRATE.

Ptychopteria Eucrate, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, fig. 24. Jan., 1883.

SHELL above the medium size, rhomboidal; body very narrow, elongate-ovate, oblique at an angle of about 30° with the hinge-line; length nearly twice the height; ante-byssal margin oblique, curving into the sinus; the ventral margin broadly curved; posterior extremity abruptly or sub-angularly recurved. Left valve convex, gibbous on the umbo and obtusely sub-angular along the post-cardinal slope. Right valve less convex, somewhat smaller than the left. Hinge-line straight; length about two-thirds the length of the valve. Beak near the anterior fourth of the length of the hinge, directed forward; beak of left valve prominent, acute, incurved over the hinge-line; beak of right valve obtuse and not elevated. Umbonal region of the left valve gibbous and angular, of the right valve convex, subtending a very acute angle. Anterior end small; margin rounded; extremity acute. Byssal depression oblique, directed backward. Wing narrow-triangular, joining the body at the posterior end; margin obliquely truncate, scarcely concave; extremity apparently not produced.

Surface marked by fine radiating striæ, which are more conspicuous on the body of the valve and upon the wing, and are very obscure on the anterior end: these are crossed by fine concentric striæ of growth which, at irregular intervals, are raised into fascicles, usually more conspicuous on the umbo and post-cardinal slope. On the right valve the radii are usually obsolete. Interior unknown, except the usual linear groove along the hinge-line.

A large left valve has a length of 40 mm., height 20 mm., and hinge-line 28 mm. Another is 38 mm. in length, height 20 mm., and hinge-line 27 mm.

In this species the body is more oblique than in *P. Salamanca;* the angularity of the left valve is in a direct line down the middle of the body; the shell is comparatively narrower; the extremity of the wing is not produced; the byssal depression is more oblique. The want of striæ on the anterior end and their obsolescence on the right valve are marked characters. It is proportionally much longer than *P. Sao*, with which it is associated.

Formation and locality. In the lower part of a conglomerate of the Chemung group at Panama, Chautauqua county, N. Y.

PTYCHOPTERIA THETIS.

Ptychopteria Thetis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body narrow-ovate, oblique at an angle of about 50° to the hinge-line; length one-third greater than the height; ante-byssal margin obliquely sub-truncate, and curving into a very shallow sinus, from which it makes a broad curve to the sub-angular posterior margin, whence it is abruptly recurved. Left valve convex below, gibbous above, very obtusely subangular along the middle. Hinge-line straight, length a little greater than the height of the valve. Beak at about the anterior third of the hinge, prominent, arching over the cardinal line and directed forward. Umbonal region gibbous, subtending an acute angle. Anterior end short, limited by a nearly vertical byssal depression; extremity acute. Wing of medium size, triangular, joining the body of the shell nearly at the posterior extremity; margin truncate, oblique; extremity apparently not extended.

Surface marked by concentric striæ, which are irregularly fasciculate, and have an angular recurvation along the middle of the body. The body and wing are marked by comparatively fine radii, which are sometimes distinctly cancellated by the concentric lines, and are obscure or obsolete on the anterior portion of the shell, which is marked only by the lamellose concentric striæ.

A specimen of the left valve of the usual size has a length of 32 mm., height 21 mm., and hinge-line 22 mm.

This species resembles *P. Sao*, but the angle of the body to the hinge-line is greater, and from the umbo to the posterior end, the valve is sub-angular; the hinge is longer in proportion, and the fold of the wing less conspicuous. A right valve in the same association has about the same proportions, but the body is narrower and the radii coarser, making the identity doubtful.

Formation and locality. In a conglomerate of the Chemung group at Panama, Chautauqua county, N. Y.

PTYCHOPTERIA FALCATA.

Ptychopteria falcata, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal, sub-falcate; body narrow-ovate, oblique at an angle of about 45° with the cardinal line; length one-fourth greater than the height; anterior and basal margins broadly rounded; posterior margin abruptly recurved. Left valve convex, gibbous above, arcuate. Right valve convex on the umbo, depressed-convex below. Hinge-line straight, greater than the height of the shell. Beak situated at about the anterior fourth of the cardinal line, prominent and arching over the hinge in the left valve; not elevated in the right valve. Umbo abruptly gibbous in the left valve, subtending an acute angle. Anterior end limited by a shallow, nearly vertical byssal depression, which inclines backward in some specimens; margin convex; extremity acuminate. Wing triangular, joining the body near the posterior end; margin straight, slightly concave just below the hinge-line; extremity acute.

Surface of both valves marked by fine radiating striæ, which are less conspicuous on the wing and obsolete on the anterior end; and with concentric striæ, which are sometimes strongly lamellose, producing undulations of the surface.

A left valve has a length of 28 mm., height 22 mm., hinge-line 24 mm. A similar right valve has a length of 28 mm., height 15 mm., and hinge-line 24 mm.

The shell of this species is comparatively longer, the body more oblique, and the wing smaller than in *P. Thetis*.

Formation and locality. In a sandstone and conglomerate of the Upper Chemung group at Alleghany Springs, Warren county, Pa.

PTYCHOPTERIA SPIO.

Ptychopteria Spio, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body elongate-ovate, oblique to the hinge-line at an angle of about 30°; length considerably more than one-third greater than the height; ante-byssal margin curving into a shallow sinus; ventral margin broadly rounded; posterior margin abruptly recurved. Left valve regularly and moderately convex, gibbous on the umbo. Right valve unknown. Hinge-line straight, greater than the height of the valve. Beak in front of the anterior third, moderately prominent and scarcely rising above the hinge. Anterior extremity narrowly acute. Wing very obliquely truncate, joining the body near the posterior extremity; the furrow and fold separating it from the body are only moderately developed; extremity not produced.

Test thin, marked by fine undulating radii which are obsolete on the anterior side; also by concentric striæ which are prominent and lamellose on the anterior.

The specimen described has a length of 35 mm., height 20 mm., hinge-line 24 mm.

This species differs from *P. Eucrate* in its comparatively greater height; it is less gibbous in the left valve, the posterior end not angularly produced, the byssal depression less conspicuous, and the radii finer. It differs from *P. Sao* in its lesser gibbosity, greater obliquity of the wing margin, and the generally subdued characters of the surface markings.

Formation and locality. In a conglomerate of the Chemung group, Panama, Chautauqua county, N. Y.

PTYCHOPTERIA EUDORA.

Ptychopteria Eudora, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body narrow, elongate-ovate, oblique at an angle of about 30° with the hinge-line; length nearly twice the height; ante-byssal margin oblique, curving into the long, shallow sinus; base broadly curved; posterior end acutely recurved. Left valve gibbous above, convex below. Right valve unknown. Hinge-line straight, greater than the height of the shell. Beak a little in front of the anterior third of the hinge, directed forward, rising above the cardinal line. Umbo narrow and gibbous, subtending a very acute angle. Anterior end small, limited by a well-marked and oblique byssal depression; extremity acute. The distance from the byssal sinus to the cardinal margin is one-half the greatest height of the valve. Wing joining the body one-fourth its length above the posterior end; the shallow furrow and fold defining its limits are not strongly marked; margin obliquely truncate; extremity not produced.

Test thin, marked by radii which are very fine and undulating on the body and wing, while they are obsolete on the anterior portion; these are cancellated by fine concentric striæ, which on some portions are fasciculate and very conspicuous on the anterior end.

The specimen described has a length of 36 mm., height 20 mm., and hinge-line about 23 mm.

This species bears considerable resemblance to *P. Eucrate,* but its anterior end is proportionally narrower, and it may also be distinguished by the absence of a continuous angularity along the body, the more abrupt recurving of the post-basal margin, the more oblique truncation of the wing, and the less conspicuous surface markings. It differs from *P. Spio* in its more gibbous umbo and more elevated beak, narrower anterior end, more abrupt recurving of the posterior margin, and conspicuous byssal sinus.

Formation and locality. In a conglomerate of the Chemung group at Panama, Chautauqua county, N. Y.

PTYCHOPTERIA ALATA.

Ptychopteria alata, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 25, 26 (21, 22?). Jan., 1883.

SHELL large, broadly rhomboidal; body sub-cylindrical, oblique at angle of about 45° with the hinge-line; height less than two-thirds the greatest length; anterior margin oblique, sloping into the broad curvature of the base; posterior margin recurved almost rectangularly, slightly acute. Left valve gibbous and angular along the axis of the body from the umbo to the post-basal extremity. Right valve less convex, and less angular in character than the left. Hinge-line straight, about one-sixth less than the greatest length of the valve. Beak very prominent in the left valve, directed forward; more depressed in the right valve; situated at about the anterior fifth of the cardinal line. Anterior extremity in the right valve small, triangular, acute. Wing large, triangular, joining the body at the posterior extremity; the limiting furrow is obscure in the left valve, but very marked in the right; margin of wing gently concave, nearly vertical; extremity angular, little produced.

Surface marked by fine radii which (in the specimens seen) are obscure in the left valve and nearly obsolete in the right; and by concentric striæ which are crowded into imbricating ridges. Some small right valves found in the same association, and referred with doubt to this species, preserve the radii in a much stronger degree.

A large right valve has a length of 42 mm., height 26 mm., and hinge-line 35 mm.

This species is distinguished by the great contrast in the convexity of the two valves. The left valve is strongly angular and elevated from the umbo to the posterior extremity; the right valve is conspicuously alate.

Formation and locality. In a coarse sandstone of the Chemung group, near Salamanca, N. Y.

PTYCHOPTERIA TRIGONALIS.

Ptychopteria trigonalis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL small or of medium size, rhomboidal; body sub-cylindrical, oblique at an angle of about 45° with the hinge-line; length one-third greater than the height; anterior margin rounded, gently curving into the broad base, with a faint byssal sinus; posterior margin almost rectangularly recurved. Left valve convex, gibbous on the umbo, and angular from the umbo to the post-basal extremity. Right valve unknown. Hinge-line straight, length greater than the height of the valve. Beak in front of the anterior third of the hinge, obtuse, prominent and incurved. Umbonal region gibbous, subtending an acute angle. Anterior end short, rounded, indistinctly separated from the body by an obscure byssal sinus. Wing large, triangular, joining the body of the valve near the posterior extremity; the limiting furrow is very distinct in young shells, and obscure in older examples; margin somewhat obliquely truncate; extremity not produced.

Surface marked by fine radii, which are obscure or obsolete on the anterior part of the shell; also by concentric striæ, which are somewhat acutely recurved on the angular portion of the body, and in older shells are fasciculate, producing an undulated aspect.

A small left valve has a length of 16 mm., height 11 mm., and hinge-line 13 mm. Another specimen has a length of 30 mm., height 18 mm., and hinge-line 25 mm.

This species has some resemblance to *P. alata* in the left valve, but its height is comparatively greater, the wing more truncate, and not produced at the extremity.

Formation and locality. In a shaly sandstone above a conglomerate in the upper part of the Chemung group at Panama, Chautauqua county, N. Y.

PTYCHOPTERIA ELONGATA.

Ptychopteria elongata, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal, elongate; body sub-cylindrical, oblique at an angle of 30° with the hinge-line; length more than one-third greater than the height; anterior margin oblique, curving into the basal margin, with a slight concavity for the byssal sinus; posterior margin abruptly rounded. Left valve regularly convex below, gibbous above. Right valve somewhat depressed-convex. Hinge-line straight, about one-fifth less than the length of the valve. Beaks near the anterior fourth of the hinge, directed forward; left beak prominent, sub-acute, arching over the cardinal line; beak of right valve depressed, obtuse, scarcely rising above the hinge-line. Umbo gibbous in the left valve; the greatest convexity of the valve is about one-third the length from the beak. Umbonal angle acute. Anterior end short, produced and acute at the extremity limited by a distinct oblique byssal depression. Wing narrow-triangular, joining the body of the shell near the posterior extremity, limited by a furrow which is not conspicuous in the lower part, but in the right valve is more marked; margin obliquely truncate.

Surface marked by fine radii, which are distinctly cancellated by the concentric striæ, when the specimen is tolerably well-preserved; also by concentric lines of growth which, at somewhat regular intervals, are sharply elevated. The radii are obsolete on the anterior of the valve, and the concentric striæ are lamellose. The connected valves show a narrow ligamental area extending half the length of the hinge. Other characters of the interior are unknown.

One specimen has a length of 35 mm., height 21 mm., and hinge-line 25 mm. Another has a length of 25 mm., height 13 mm., and hinge-line 20 mm.

This species resembles *P. Eucrate*, but is less gibbous, more elongate, and without angularity along the body.

Formation and locality. In a conglomerate of the Chemung group at Panama, Chautauqua county, N. Y.

PTYCHOPTERIA GALENE.

Ptychopteria Galene, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished*.

SHELL small, rhomboidal; body sub-elliptical, oblique at an angle of about 40° with the hinge; height greater than half the length; ante-byssal margin oblique, curving gently into a shallow sinus; base regularly rounded; posterior end abruptly recurved. Left valve convex, moderately gibbous on the umbo, and sub-angular along the upper half. Right valve less convex above, depressed-convex in the lower part. Hinge-line straight, length greater than the height of the valve. Beaks near the anterior third of the hinge, inclined forward, prominent, arching over the hinge-line. Umbo gibbous, subtending somewhat less than a right angle. Anterior end small, limited by the shallow, nearly vertical byssal depression; extremity acute. Wing wide-triangular, joining the body near the posterior end; limiting furrow distinct; fold wide and moderately prominent; margin obliquely truncate, very slightly concave just below the hinge-line; extremity angular.

Surface of the body and wing marked by regular, fine, interrupted or undulating radii, which are obscure or obsolete on the anterior portion; also by very fine concentric lines, which are crowded into irregular fascicles and are lamellose on the anterior part of the valve.

A left valve has a length of 26 mm., height 18 mm., and hinge-line 20 mm. Another specimen has a length of 24 mm., height 14 mm., and hinge-line 17 mm.

Compared with *P. Eucrate* and *P. elongata*, the body of the shell is comparatively shorter, the furrow of the wing more distinct, the byssal depression shallower and more nearly vertical. It has the obscure angularity of *P. Eucrate*, with coarser and more nearly vertical radii.

Formation and locality. In the lower beds of the Upper Division of the Chemung group, as seen at Warren, Pa.

PTYCHOPTERIA BEECHERI.

Ptychopteria Beecheri, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, rhomboidal; body cylindrical, very arcuate in the left valve, oblique at an angle of about 40° with the hinge; length nearly twice the height; ante-byssal margin slightly oblique, curving gently into the sinus; ventral margin broadly rounded, straighter toward the posterior end which is acutely recurved. Left valve ventricose, the greatest convexity a little above the middle; abruptly rounded or sub-angular along the post-cardinal slope, and the elevation is continued into the angular posterior extremity. Right valve much less convex. Hinge-line straight, length more than two-thirds the length of the shell. Beaks at about the anterior third of the hinge-line, very prominent and incurved over the hinge in the left valve. In the right valve the beak is subdued, not rising above the hinge-line. Umbo very gibbous in the left valve, subtending an acute angle. Anterior end moderately large, limited by a very broad, shallow, slightly oblique byssal depression; extremity flattened, acute, defined by an oblique constriction in the margin just below the cardinal line. Wing of medium size, joining the body of the shell a little above the posterior extremity; the limiting furrow distinct; the fold gentle and the upper part of the wing flat or slightly convex; margin obliquely truncate, concave just below the hinge; extremity slightly produced.

Surface marked by fine uniform radii on the body and wing, which are nearly obsolete on the anterior end, and sometimes interrupted on the body by varices of growth; also by fine concentric striæ which are acutely recurved over the angular posterior slope of the body, and crowded into fascicles at irregular intervals, producing an undulated appearance.

A large left valve has a length of 52 mm., height 28 mm., and hinge-line 36 mm. A right valve in the same association has a length of 40 mm., height 20 mm., and hinge-line 33 mm.

This species somewhat resembles *P. trigonalis*, but the posterior extremity is more produced, and the wing more obliquely truncate on the margin. The right valve in general aspect resembles the right valve of *P. alata*, but the left valve is very dissimilar. The distinguishing characters are its large rhomboidal form, extreme gibbosity and arcuation of the left valve.

Formation and locality. In a compact sandstone of the Upper Chemung group, in the lower beds as seen at Warren, Pa.

PTYCHOPTERIA SPATULATA.

Ptychopteria spatulata, HALL. Pal N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, elongate, rhomboidal; body sub-elliptical, oblique at an angle of about 30° with the hinge; length more than one-third greater than the height; ante-byssal margin oblique, gently curving into the sinus, thence extending into the broadly curved basal margin; posterior end rectangularly or acutely recurved. Left valve moderately convex, slightly gibbous above. Right valve depressed-convex, more sub-angular along the post-cardinal slope, and smaller than the left. Hinge-line straight, length about one-seventh less than the greatest length of the valve. Beaks at about the anterior fourth, prominent and incurved over the hinge-line in the left valve; depressed in the right valve and not rising above the cardinal line. Umbonal angle nearly rectangular. Anterior end large, limited by a broad, slightly oblique, undefined byssal depression; extremity acute and nasute. Wing elongate, triangular, joining the body at the posterior end; the dividing furrow distinct in the left valve, more conspicuous in the right; the fold is not defined in the left valve, and is strongly marked in the right; margin nearly vertically truncate; extremity not perceptibly produced.

Test thin, marked by fine radii, which are conspicuous upon the body and wing, and obsolete on the anterior end and byssal depression. The surface is also marked by fine concentric striæ, which are crowded into fascicles, giving an apparent undulation to the surface from the umbo to the lower extremity, especially in the right valve. At the post-basal margin the striæ are recurved at a little less than a right angle in the left valve, and more acutely in the right valve, and they are strongly lamellose on the anterior end.

The specimen described has a length of 56 mm., height 30 mm., and hinge-line about 48 mm.

This species resembles *P. lata*, and also some forms of *P. Sao*, but it is much more elongate, the valves more depressed, the wing narrower and longer.

Formation and locality. In the Upper Chemung group at Warren, Pa.

PTYCHOPTERIA LATA.

Ptychopteria lata, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, rhomboidal; body sub-elliptical, very oblique, making an angle with the hinge of nearly 40°; height equal to about two-thirds of the length; ante-byssal margin oblique, curving into the shallow sinus, from whence the basal margin is broadly rounded; posterior extremity recurved at a little less than a right angle. Left valve more convex than the right and gibbous above, obscurely angular along the post-cardinal slope. This difference in the valves is also shown in the direction of the striæ of growth. Hinge-line straight, about three-fourths as long as the length of the shell. Beaks near the anterior fourth of the hinge, prominent in the left valve, acute, arching over the cardinal line; in the right valve depressed, rising only as high as the hinge. Umbonal region of the left valve moderately gibbous, subtending an acute angle. Anterior end short, small, limited by an oblique byssal depression which extends along the base about one-third the length of the shell; extremity acute. Wing large, extending along the shell to near the posterior extremity; margin obliquely truncate, concave just below the hinge-line, which is abruptly produced.

Test thin, marked by fine, interrupted or undulated radii, which are more strongly marked on the body and wing, and obsolete on the anterior of the valve; the surface is also marked by fine concentric striæ, which are crowded into fascicles at unequal distances, undulating the surface; they turn abruptly outward, just below the hinge, and are lamellose on the anterior part of the valve.

A specimen preserving both valves has a length of 45 mm., height 28 mm., hinge-line 35 mm. The right valve is somewhat smaller. Another specimen has a length of 42 mm., height 28 mm., hinge-line 36 mm.

This species resembles in form *P. Sao*, but is larger, the wing furrow more strongly defined on the left valve, the concentric lines more acutely recurved at the basal angle, and the radii are finer and more numerous.

Formation and locality. In the Upper Chemung group, the middle beds of the series, as seen at Warren, Pa.

PTYCHOPTERIA PERLATA.

Ptychopteria perlata, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, rhomboidal; body ovate, oblique; length one-sixth greater than the height; anterior and basal margins broadly curved; posterior end angular. Left valve very convex, gibbous above. Right valve somewhat gibbous above, having a convexity of about one-half that of the left valve. Hinge-line straight, nearly equal to the length of the shell. Beak at about the anterior third of the cardinal line, prominent and arching over the hinge in the left valve. Umbo gibbous in the left valve and convex in the right, subtending an acute angle. Anterior end large, obscurely defined by a shallow byssal depression, which is obsolete in the right valve; margin convex; extremity acuminate. Wing broad-triangular, joining the body at the posterior end; the furrow and fold are stronger in the left valve; margin slightly convex below, inclining a little forward; extremity produced, acute-angular.

Surface of the left valve marked by fine, close, rounded radii, which are often interrupted by the concentric lamellæ. The radii are finer upon the wing, obsolete upon the anterior end, and scarcely present on the right valve. The concentric lines of growth and lamellæ give an irregularly undulating appearance to the surface.

A left valve has a length of 31 mm., height 26 mm., and hinge-line 30 mm. A right valve measures 33 mm. in length, 27 mm. in height, and hinge-line 32 mm.

This species is a shorter, more erect form than *P. lata*, and the left valve is more convex and broader below.

Formation and locality. In the upper beds of the Chemung group at Warren, Pa.

PTYCHOPTERIA THALIA.

Ptychopteria Thalia, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body ovate, oblique at an angle of about 45° with the cardinal line; length one-third greater than the height; anterior and basal margins broadly rounded, slightly impressed by the byssal sinus; post-basal extremity sub-angular, abruptly recurved. Left valve extremely gibbous, the point of greatest convexity is one-third of the height from the beak. Right valve convex on the umbo, depressed-convex below. Hinge-line straight, a little less than the greatest length of the shell. Beak situated at the anterior third of the hinge, prominent in the left valve, curving over the hinge-line. Umbonal region abruptly gibbous in the left valve, distinctly limited, subtending an acute angle. Anterior end comparatively large, limited by a nearly vertical shallow byssal depression; margin convex; extremity acute. Wing small, distinctly limited by the post-umbonal furrow; margin obliquely truncate, a little convex, extremity obtuse-angled.

Surface of both valves marked by fine radii originating on the umbo, becoming stronger on the lower part of the body, less conspicuous on the wing, and obsolete on the anterior end; and by lines of growth which are lamellose on the anterior side and produce unequal concentric ridges on the body of the valve.

A left valve has a length of 25 mm., height 17 mm., and hinge-line 23 mm. A small right valve has a length of 20 mm., height 13 mm., and hinge-line 16 mm.

This species resembles *P. perlata* but the wing is comparatively smaller, extremity not acuminate, and the umbo more gibbous.

Formation and locality. In a sandstone of the Upper Chemung group at Alleghany Springs, Warren county, Pa.

PTYCHOPTERIA GIBBOSA.

Ptychopteria gibbosa, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL small, rhomboidal; body broad-ovate, oblique at an angle of about 45° with the hinge-line; length not more than one-seventh greater than the height; ante-byssal margin oblique, curving into the marked sinus, thence along the base to the nearly rectangularly recurved posterior extremity. Left valve very convex, gibbous on the umbo and in the middle. Right valve unknown. Hinge-line straight, nearly as long as the length of the shell. Beaks a little anterior to the middle of the hinge; very prominent in the left valve and arching over the hinge. Umbonal region ample, very gibbous, obscurely angular along the posterior slope, subtending an acute angle. Anterior end somewhat large, gibbous, and separated from the body of the shell by a nearly vertical sulcus; extremity acute and nasute. Wing of medium size, joining the body at the posterior end; the furrow and fold are very conspicuous, the fold somewhat broader and nearly equal to the portion of the wing above; margin almost vertically truncate; extremity apparently not produced.

Test thin, marked by fine radii and concentric striæ. The concentric lines are crowded into fascicles, producing an undulated appearance; and are strongly lamellose on the anterior end; the radiating striæ are distinct upon the body of the shell, obscure on the wing, and obsolete on the anterior end.

A specimen of the left valve has a length of 26 mm., height 15 mm., hinge-line 32 mm. Another has a length of 20 mm., height 13 mm., hinge-line 18 mm.

This species is distinguished by the sub-central position of the beak and the great prominence of the umbo, the marked byssal depression and strong furrow and fold of the wing.

Formation and locality. In the upper beds of the Chemung group, at Warren, Pa.

PTYCHOPTERIA LOBATA.

Ptychopteria lobata, HALL. Pal. N. Y., vol. v. pt. 1. *Unpublished.*

SHELL small, sub-rhomboidal; body broadly ovate, oblique at an angle of about 55° with the cardinal line; length somewhat greater than the height; anterior margin sub-truncate; base broadly rounded; posterior margin rectangularly recurved into the wing. Left valve very gibbous; the point of greatest convexity is just below the umbo. Right valve unknown. Hinge-line straight, length nearly equal to the length of the valve. Beak situated anterior to the middle of the hinge, prominent, inclined forward, and arching over the margin of the valve. Umbonal region ample, gibbous, subtending an acute angle. Anterior end large, limited by a broad, undefined byssal depression; margin convex; extremity apparently obtuse. Wing small, joining the body at the posterior end, strongly limited by a deep furrow and very marked alar plication; margin nearly straight; extremity angular.

Surface marked by fine radiating striæ which become finer on the wing and anterior end; and by striæ of growth which are somewhat lamellose on the anterior of the shell.

A left valve of this species has a length of 13 mm., height 10 mm., hinge-line 11 mm.

This species differs from *P. gibbosa* in its shorter, truncate anterior end, and stronger fold on the wing, which is comparatively stronger than in any species yet observed.

Formation and locality. In the sandstones of the Upper Chemung group, Warren county, Pa.

PTYCHOPTERIA VANUXEMI.

Ptychopteria Vanuxemi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, sub-triangular; body narrow-elongate, sub-cylindrical, oblique at an angle of nearly 30° with the hinge-line; ventral margin very long and gently curving; posterior margin abruptly and acutely recurved. Left valve very convex along the axis of the body. Right valve unknown. Hinge-line straight, length more than one-fourth greater than the height, or about two-thirds the entire length of the shell. Umbonal angle very acute. Anterior end unknown. Wing very large, triangular, joining the body near the posterior end; the furrow and fold obscure; margin obliquely truncate to near the hinge, where it is concave and abruptly recurved into the produced extremity.

Test thin, marked by strong radii, and by fine, sharp, equidistant, lamellose concentric striæ. The concentric striæ are crowded and somewhat fasciculate on the posterior and the wing, giving an undulated or imbricated appearance. The rays are very strong over the middle of the body, and subdued on the wing and basal side, and are distinctly crenulated by the elevated concentric lines, with the interspaces cancellated.

The specimen described has a length of 70 mm., height 34 mm., and hinge-line about 44 mm.

This species is conspicuously distinct from any other; in outline it approaches some of the extreme forms of *Pteronites*.

Formation and locality. In the highest beds of the Upper Chemung group at Warren, Pa.

PTYCHOPTERIA EXPANSA.

Ptychopteria expansa, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 10, 11. Jan., 1883.

SHELL of medium size, sub-rhomboidal; body ovate, oblique at an angle of about 60° with the hinge-line; length one-fifth greater than the height; ante-byssal margin oblique, gently curving into the shallow sinus; basal margin broadly rounded to the base of the wing. Left valve convex below, gibbous above. Right valve unknown. Hinge-line straight, central, length greater than the length of the valve. Beak at about the anterior fifth of the hinge, inclined acutely forward, moderately prominent. Umbonal angle acute. Anterior end small, surface convex to the nearly vertical byssal depression which extends half way to the base of the shell; extremity compressed and acute. Wing very large, triangular, extended, joining the body at the posterior extremity; the furrow obscurely marked; margin gently concave, extending backward; extremity produced.

Surface marked by regular strong radii and by concentric lines of growth. The concentic striæ are sometimes crowded into irregular fascicles, giving an undulated appearance to the surface; the radii are strong on the umbonal slope, less conspicuous on the wing, and on the antero-basal portion they are interrupted, and oblique to those on the umbo.

The specimen described has a length of 27 mm., height 22 mm., and hinge-line 30 mm.

This species is distinguished by its erect form, large and extended wing, and peculiar character of surface markings. The furrow of the wing is indicated only by a wider depression between the radii, and a stronger ray marks the fold.

Formation and locality. In a coarse sandstone of the Chemung group near Smethport, Pa.

GLYPTODESMA, HALL.

GLYPTODESMA ERECTUM.

Avicula erecta, CONRAD. Jour. Acad. Nat. Sci., Phila., p. 328, pl. 12, fig. 5. 1842.

Avicula cruciformis, CONRAD. Geolog. Surv. N. Y.: Ann. Rep., p. 54. 1841.

Actinodesma erectum (CONRAD), HALL. MS., Pal. N. Y. 1877.

" " " S. A. MILLER. Cat. Amer. Pal. Foss. 1877.

" *cruciforme* (CONRAD), HALL. MS., Pal. N. Y. 1877.

" " " S. A. MILLER. Cat. Amer. Pal. Foss. 1877.

Glyptodesma erectum (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 11, figs. 1-10; pl. 12, figs. 1-3. 5-9; pl. 13, figs. 1-4, 12-15; pl. 25, figs. 14-17. Jan., 1883.

SHELL large; body ovate, acute, erect or moderately oblique; wings more or less expanded, often greatly expanded; height frequently one-third greater than the length; basal margin more or less regularly rounded; anterior side broadly convex; posterior side nearly straight or slightly concave. Valves very unequal. Left valve varying from moderately convex to gibbous and arcuate. Right valve depressed-convex in the umbonal region, flat or concave below; variable in convexity. Hinge-line straight, often greatly extended, equaling or usually greater than the length of the valve. Beak of left valve prominent, acute, inclined forward, rising above the hinge-line, and situated anterior to the middle of the body of the shell. Umbonal region somewhat prominent, often gibbous, limited anteriorly by a distinct rounded sulcus, and posteriorly by an interruption and change in the direction of the striæ, which sometimes produces a defined line of separation. Umbonal angle acute. Anterior wing auriform and small in young specimens, becoming expanded and variously extended in older specimens, limited by a distinct byssal depression; extremity rounded. Posterior wing large, triangular; margin concave; extremity often extended beyond the margin of the shell.

Test thick, marked by fine, irregular, concentric striæ of growth which are sometimes raised into sharp lamellæ, or crowded into prominent fascicles. These striæ become more conspicuous upon the margins and upon the wings, where they are often highly lamellose. The distant lamellæ which mark the body of the shell are sometimes continued upon the hinge, and becoming stronger, curve over the margin, giving it a sharply annulated aspect, which, when preserved in the impression of the hinge-border, might be mistaken for a more important organic marking. Partially exfoliated shells show some obscure radiating lines which belong to the intimate shell-structure, and are not external.

Posterior muscular impression situated near the middle of the posterior slope, and marked by irregular vascular striæ; from the lower anterior side of this impression the pallial line extends slightly downward, curving forward, and continuing in a line nearly parallel to the margin it terminates in a small muscular impression within the rostral cavity. The pallial line is frequently pitted or interrupted in its course, and from these pits radiating grooves extend toward the margin of the shell. Ligamental area extending the entire length of the hinge, comparatively wide, grooved longitudinally with fine, continuous parallel lines. Hinge with one or two linear, slightly oblique, lateral teeth on the posterior side, and with numerous erect or oblique irregular folds along the cardinal line below the ligamental area, which terminate on the inner margin in distinct crenulations. The cardinal wrinkles are smaller and more regular anteriorly, becoming large and irregular posterior to the beak.

Three large specimens have the following respective dimensions: length 90, 70 and 81 mm., height 100, 99 and 81 mm., hinge-line 100, 90 and 90 mm. An example of medium size has a length of 55 mm., height 76 mm., and hinge-line 48 mm. A large, erect individual measures 72 mm. in length, and 90 mm. in height. A small right valve has a length of 23 mm., height 27 mm., and hinge-line 33 mm.

This is an abundant species and attains a very large size in older individuals. In its different conditions of growth and preservation, it presents a very great variety of aspect, and it becomes extremely difficult to determine the limits of the species. In the young shell the posterior wing is proportionally more extended than in older individuals, while the anterior wing is usually smaller. During the progress of growth, both wings often become extravagantly developed, and the form and proportions of these parts cannot be relied upon for specific distinctions. The characteristic forms have the body nearly erect, with the umbo and beak directed slightly forward; but associated with these are other forms which present a considerable degree of obliquity in the body of the shell, and while there seem to be no constant marks of specific distinction, it is extremely unsatisfactory to group them all under one species.

The interior characters also present considerable differences, the number of lateral teeth varying from one to three; the cardinal wrinkles and crenulations not only vary in number and strength, but in their direction, which is vertical or oblique. There is also a very great difference in the width of the ligamental area.

Formation and localities. In the shales and shaly sandstones of the Hamilton group, from the eastern limit of the formation as far west as Canandaigua lake; it is extremely abundant in Albany and Schoharie counties; Cazenovia and Hamilton, in Madison county, and at Pratt's falls, in Onondaga county, N. Y. This species is also found in a cherty limestone in Clarke county, Indiana; and in similar conditions and associations at several localities in Ohio.

GLYPTODESMA ERECTUM, var. OBLIQUUM.

Glyptodesma erectum, var. *obliquum*, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 12, fig. 4; pl. 13, figs. 5-11. Jan., 1883.

THIS variety possesses the essential characters of the typical forms of the species. The hinge, test, etc., are similar, but the body of the shell is distinctly oblique; the wings are less developed, and the anterior wing, especially, has not the great extension often observed in the erect forms. The specimens of this variety are uniformly smaller. They have been observed mainly in the soft shales at Pratt's falls, Onondaga county, while the large, erect forms are common in the coarse shales and grits of the group in the eastern portion of the State, and in Madison county.

In examining and comparing the extreme forms, the difference is striking and distinctive. But in the study and comparison of a series of several hundred specimens, the intermediate forms appear to unite the whole under a single species.

To facilitate the examination, the oblique forms are here designated as *G. erectum*, var. *obliquum*.

GLYPTODESMA OCCIDENTALE.

Glyptodesma occidentale, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 15, fig. 12. Jan., 1883.

SHELL large, broadly ovate; body nearly erect; height and length about equal; margins regularly curved. Left valve very convex; gibbous on the umbo. Right valve unknown. Hinge-line straight, equaling or greater than the length of the shell. Beak anterior to the middle of the shell, directed slightly forward, acute and prominent. Umbonal region gibbous, defined anteriorly by the broad sulcus, and on the posterior side sloping abruptly to the wing. Anterior wing short, defined by a deep sulcus and a marked byssal sinus. Posterior wing large, depressed-convex, much extended, joining the body of the shell below the middle, and defined only by the recurving of the striæ; margin concave; extremity acute.

Test thick, marked by numerous fine striæ of growth, which at intervals are crowded into fascicles, producing an undulating surface. The striæ are more closely arranged, and become lamellose on the anterior part of the shell. On the posterior wing the striæ are regular, and at distant intervals a single striæ becomes sharply elevated.

The specimen of this species described has a length 60 mm., height 66 mm., and hinge-line equal to, or greater than, the length of the shell.

This species resembles *G. erectum*, but appears to be a more robust form: the shell is more orbicular, the umbonal region more gibbous, the surface more rugose from the undulations of the fascicles of striæ, and the limitation between the body and the posterior wing is less strongly defined.

Formation and localities. In the limestone of the Upper Helderberg group at the falls of the Ohio, near Louisville, Kentucky, and in Clarke county, Indiana.

LEIOPTERIA, HALL.

LEIOPTERIA LÆVIS.

Avicula lævis, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 181. 1843.
Pteronites lævis (HALL), S. A. MILLER. Cat. Amer. Pal. Foss., p. 202. 1877.
Leiopteria lævis, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 17, figs. 5-11. Jan., 1883.

SHELL small, sub-rhomboidal; body obliquely ovate; length and height nearly equal; greatest length below the middle; margins regularly rounded, somewhat extended on the post-basal side. Left valve more convex than the right; the greatest convexity in both valves is about the middle. Hinge-line straight on the posterior side of the beak, turning abruptly downward in front; entire length greater than the length of the shell. Beaks obtuse, rounded, inclined forward, situated at the anterior third of the shell, that of the left valve quite prominent. Umbonal region of left valve prominent, subtending an acute angle. Ear triangular, nearly equilateral, with a strong angular fold along the middle, separated from the body of the valve by a distinct rounded sulcus and broad byssal sinus; margin rounded; extremity obtuse. Wing triangular, flat, limited by the post-umbonal slope; margin concave; extremity acute.

Test thin, marked with distinct concentric striæ of growth, which are crowded and conspicuous on the wings. There are often obscure traces of radii, which are more distinct on the wing in casts or exfoliated specimens. Ligamental area narrow, with a single distinct groove. Some specimens apparently indicate the existence of an oblique lateral tooth on the posterior side of the umbo.

One specimen has a length of 11 mm., height 12 mm., hinge-line about 10 mm. Another has a length of 10 mm., height 11 mm., and hinge-line 12 mm. A small specimen is 8 mm. in length, 9 mm. in height, and hinge-line 10 mm.

Formation and localities. In the Marcellus shale at Littleville, Livingston county, Alden, Erie county, and East Bloomfield, Ontario county, N. Y.

LEIOPTERIA CONRADI.

Leiopteria Conradi, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations. Pl. 20, figs. 1, 2, 4 (5 in error). Jan., 1883.

SHELL above the medium size, sub-rhomboidal; body oblique-ovate; length a little greater than the height; anterior margin straight, nearly vertical; basal and posterior margins regularly rounded. Valves sub-equally convex; the left valve somewhat more convex than the right. Hinge-line straight, longer than the length of the valve, greatly extended posteriorly. Beaks acute, directed forward, prominent, situated near the anterior end of the shell. Umbonal region gibbous (in well-preserved shells), moderately convex below, subtending an acute angle. Ear short, separated from the valve by a rounded depression or sulcus, marked by a shallow, elongate byssal sinus, extremity rounded. Wing triangular, much extended; margin concave; extremity acuminate.

Test, as indicated by casts or partially exfoliated specimens, marked by fine, closely arranged, concentric lines of growth, which at irregular intervals are crowded and raised into rounded or sub-angular fascicles, giving the surface a decidedly undulated aspect. The striæ become more crowded upon the cardinal expansions, especially upon the ear. Ligamental area marked by a single longitudinal groove parallel to the hinge-line.

Two specimens of the left valve have respectively the following dimensions: length 39 and 42 mm., height 32 and 36 mm., hinge-line 42 and 47 mm.

This species bears some general resemblance in form to *Actinopteria decussata* and *A. Boydi* but is distinguished by the absence of rays. It differs from *L. Greeni*, in its more oblique form and greater proportional length.

Formation and localities. In shales of the Hamilton group, on the shore of Canandaigua lake, and at Bellona, Yates county, N. Y.

LEIOPTERIA GREENI.

Leiopteria Greeni, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations · Pl. 20, figs. 9, 12. Jan., 1883.

SHELL, large; sub-rhomboidal; body moderately oblique, broadly ovate; length a little greater than the height; margins regularly rounded, somewhat extended posteriorly. Valves moderately and nearly equally convex; similar in character. Hinge-line straight, equaling or greater than the length of the shell. Beaks acute, anterior, inclined forward, arching over the hinge in the left valve; less prominent in the right. Ear short, limited by a sulcus and sinus which is deeper in the right valve. Wing large, triangular, defined only by the abrupt bending of the striæ; margin concave; extremity acute.

Test thin, marked by numerous, closely arranged, concentric lines of growth, and, at somewhat regular intervals, by sharp, projecting lamellose striæ; and corresponding with these, are regular concentric undulations, which are shown strongly on the cast, and but partially seen on the exterior surface. The striæ mark the wing in the same manner as the body, and are crowded on the ear. Ligamental area narrow, marked by a single groove.

A large specimen measures 57 mm. in length, 51 mm. in height, hinge-line 58 mm.

This species resembles *L. Conradi*, but is broader, with comparatively greater height, less obliquity, and less extended posterior wing.

Formation and localities. In the shales of the Hamilton group at Bellona, Yates county, and on the shores of Cayuga and Canandaigua lakes, N. Y.

LEIOPTERIA RAFINESQUII.

Leiopteria Rafinesquii, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 15, fig. 11; pl. 20, figs. 6, 7. Jan., 1883.

SHELL of medium size, sub-rhomboidal; body rather narrow above, obliquely ovate; height equaling or greater than the length; margins regularly curved; the post-basal side extended; anterior side sometimes nearly straight for a short distance below the ear. Left valve convex, gibbous on the umbo. Right valve less gibbous. The right valve supposed to belong to this species is convex on the umbo, and of moderate convexity below; the height is considerably greater than the length, and the body of the valve less distinctly defined than in the left valve. Hinge-line straight; from the anterior side of the beak to the posterior extremity it is about equal to the length of the shell. Beak of the left valve acute, directed forward, very prominent, situated at the anterior extremity of the shell. Umbonal region gibbous, subtending an acute angle. Ear short, convex, obtuse, with a broad, undefined, vertical sulcus and shallow byssal sinus. Wing moderately large, flat; margin concave; extremity acute.

Test thin, marked by regular, concentric lines of growth, which are more crowded upon the cardinal expansions. The striæ are raised at intervals into strong, elevated lamellæ, which are conspicuous on the cast, and more crowded and prominent on the anterior side. The right valve referred to this species is marked by concentric wrinkles, which are well-preserved on the anterior side, with distant, elevated, lamellose striæ on the wing and margin of the hinge. Internal characters unknown. The ligamental area appears to be marked by a groove along the wing parallel to the hinge-line.

Three characteristic specimens have respectively the following dimensions: length, 39, 34, and 25 mm., height 41, 38, and 26 mm., hinge-line 37, 39 and 26 mm. The right valve, mentioned above, is 23 mm. in length, 25 mm. in height, and 23 mm. along the hinge-line.

This species resembles the two preceding, but the form of body is more narrowly ovate, the obliquity appears to be intermediate between the two; the ear is less strongly defined; the wing is comparatively narrower, and less extended at the extremity.

Formation and localities. In the shales of the Hamilton group, on the shores of Skaneateles lake; at Bellona, Yates county, and Leonardsville, Madison county, N. Y.; a single specimen from the Corniferous limestone of Delaware, Ohio, has been referred to this species.

LEIOPTERIA SAYI.

Leiopteria Sayi, HALL. Pal. N. Y. vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-orbicular; body very broadly ovate, scarcely oblique; height greater than the length; margin nearly straight in front, thence regularly rounded. Left valve very convex, gibbous in the umbonal region. Right valve smaller and les convex. Hinge-line straight, longer than the length of the shell Beaks acute, situated near the anterior extremity of the hinge prominent, inclined forward, arching over the hinge-line. Umbona region ample, subtending a right angle. Ear small, bending down ward, defined by a broad, shallow sulcus. Byssal sinus narrow Wing large, triangular, greatly extended along the hinge-line, de fined by the retral bending of the striæ; margin concave; ex tremity acute. The wing of the right valve is very broad, flat, anc much extended; not distinctly defined.

Surface marked by fine, closely arranged striæ of growth, witl distant, elevated lamellæ, which are extensions of strong fascicle of striæ. These leave angular concentric folds and undulations in the casts. The striæ are strongly marked on the cardinal expansions and over the hinge-margin. In well-preserved specimens the undulations are stronger upon the middle of the valve, and les marked upon the anterior side and the wing. In the right valve they are much more regular and subdued. Interior characters unknown. Ligamental area marked by a distinct groove parallel to the margin.

The largest specimen has a length of 50 mm., height 53 mm., hinge-line about 45 mm. A small specimen measures 26 mm. in length, 39 mm. in height, hinge-line imperfect. Another specimen is 26 mm. in length, 33 mm. in height, hinge-line 27 mm. A right valve is 33 mm. in length, height about the same, hinge-line 41 mm.

This form resembles in general surface characters, the three preceding species, but differs by the more erect body and sub-orbicular form. In general aspect it resembles GLYPTODESMA, and the surface markings are not very different, though none of the specimens show the hinge characters of that genus. The description has been drawn from specimens preserved in fine calcareous shale and in coarser arenaceous material, and the characters remain essentially the same in both.

In a single specimen from the arenaceous shales on the shore of Cayuga lake, at Norton's Landing, where the shell is partially exfoliated, the surface is marked by fine, concentric lines of growth, and more distant lamellose striæ, which are about twice as numerous as in the typical specimens. These give a gently undulating character to the surface of the cast of the left valve, instead of the abrupt angular folds of the typical specimens. In the right valve of the same specimen the striæ on the umbo are similar, but more closely arranged, and on the lower portion, in the cast, they exhibit the gentle undulations of the typical forms of the right valve.

Formation and localities. In shales of the Hamilton group, in Ontario county; Norton's Landing, Cayuga county; Bellona, Yates county, and in the coarse grits at Leonardsville, Madison county, N. Y.

LEIOPTERIA DEKAYI.

Leiopteria Dekayi, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 19, fig. 1; pl. 20, figs. 16–18 (19 in error). Jan., 1883.

SHELL of medium size, sub-rhomboidal in general form; body narrowly ovate, oblique; length about equal to the height; anterior margin nearly vertical for one-third the length of the shell, thence broadly rounded over the basal margin and abruptly recurved at the post-basal extremity. Left valve convex, gibbous on the umbo. Right valve smaller and less convex; the limitation of the wing not strongly defined. Hinge-line straight, length a little less than the length of the shell measured from the anterior side of the beak to the extremity of the wing. Beaks anterior, acute, prominent, inclined forward. Umbonal region gibbous above, regularly convex below, subtending an acute angle. Ear bending downward, with a strong fold in the upper part, limited by a broad undefined sulcus and shallow byssal sinus. Wing, triangular, flat, defined by the abrupt retral bending of the striæ and a depressed line along the post-cardinal slope; margin concave; extremity acute.

Test thin, marked by fine, regular, concentric striæ, which at unequal intervals are crowded into fascicles, giving an undulated aspect to the surface of the cast; in old specimens, more crowded on the anterior side and ear, and on the wing usually regular, sometimes becoming a little fasciculate on the margin. This description of the surface is taken from casts or partial casts which preserve more or less the surface markings. In a few younger specimens from the shales, the surface shows fine regular striæ which gradually become fasciculate as the shell increases in size. Ligamental area narrow, marked by fine striæ; below this area is a narrow oblique fold or lateral tooth.

Three specimens have respectively the following dimensions: length, 37, 31, and 29 mm., height, 37, 30, and 30 mm., hinge-line, 31, 21, and 23 mm. A smaller specimen has length of 17 mm., height 16 mm., hinge-line 15 mm.

This species resembles in form *L. Conradi* and *L. Rafinesquii*, but here are some differences in shape and obliquity and more decidedly in surface characters. The wing is not so much extended as in *L. Conradi,* the striæ are more abruptly recurved, and the post-cardinal slope is more strongly defined. There is a general resemblance with *L. Bigsbyi,* but the body and hinge-line are longer, the body narrowing more rapidly from the base, and the striæ are equal and uniform.

Formation and localities. In the soft shales of the Hamilton group, at Skaneateles and Cayuga lakes; and in the upper coarse beds and lower shales at Pratt's falls, Onondaga county; also at Schoharie, N. Y. It is widely distributed from the eastern to the central portion of the State.

LEIOPTERIA BIGSBYI.

Leiopteria Bigsbyi, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 20, figs. 3, 11, 13–15. Jan., 1883.

SHELL larger than medium size, sub-rhomboidal; body ovate, oblique; height greater than the length; anterior margin nearly vertical for about half the height of the shell, thence regularly rounded along the base; posterior side moderately extended. Left valve gibbous upon the umbo, less convex toward the base. Right valve gibbous on the umbo, depressed-convex below, shorter than the left valve. Hinge-line straight, equaling or less than the length of the shell. Beaks anterior, acute, prominent, rising above the hinge-line, inclined forward. Umbonal region prominent, subtending an angle of about 55°. Ear short, bending moderately downward, with a strong fold at the upper side, limited by a broad, undefined sulcus. Byssal sinus shallow. Wing triangular, wide, nearly flat; margin concave; extremity acute. The wing of the right valve is less defined than the left, and the byssal sinus is a little deeper.

Test thin; specimens partially exfoliated, or occurring in the condition of casts, show sharply elevated, lamellose, concentric striæ, which are very distinct on the wings, and crowded and somewhat fasciculate on the anterior side and ear. No intermediate finer striæ have been observed. In well-preserved specimens the sharp lamellæ have undulating margins. Interior unknown. Ligamental area marked by a single groove.

A large specimen has a length of 43 mm., height 50 mm., hinge-line 37 mm. Another example has a length of 32 mm., height 33 mm., hinge-line 30 mm. In the younger shells the height is proportionally somewhat less than in the older ones.

This species, compared with the preceding, has a greater height of body and shorter hinge-line, and differs in the conspicuous, sharp, centric lamellæ. In this species the concentric striæ do notproce the folds and undulations which are characteristic of *L. Rafinuii* and *L. Greeni.*

Formation and localities. In shales of the Hamilton group at att's falls, Onondaga county, and in the coarser beds at Schoharie Y

LEIOPTERIA MITCHELLI.

eiopteria Mitchelli, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 20, fig. 8. Jan., 1883.

ELL large, sub-rhomboidal; body ovate, moderately oblique; height greater than the length; anterior margin nearly vertical from the ear for about half the height, then broadly curving to the post-basal side, thence more abruptly bending, making the posterior end slightly extended. Left valve gibbous on the umbo, sloping from highly convex above to moderately convex below. Right valve unknown. Hinge-line straight, equal to the length of the valve. Beak anterior, acute, inclined forward, prominent. Umbonal region prominent, subtending an acute angle. Ear short, limited by an undefined sulcus and shallow byssal sinus. Wing large, triangular, nearly flat, defined by the retral curving of the lamellose striæ; margin moderately concave; extremity abruptly acute.

Test thin, marked by regular concentric lines of growth, with distant, lamellose striæ, which are raised into thin, sharp elevations corresponding with the concentric folds or undulations of the shell. The cast shows only the undulations. On the anterior margin and wing, the lamellæ are closely crowded, producing a varicose appearance. They are more closely arranged upon the wing than on the valve, making a gentle retral curve and becoming very conspicuous on the hinge-margin. Interior unknown. Ligamental area narrow.

A left valve has a length of 46 mm., height 49 mm., hinge-line about 47 mm.

This species, in general proportions, resembles *A. Bigsbyi;* it differs the larger and more extended posterior end, with striæ nearly veral or gently curving, except at the hinge margin; the body wider ove, and the anterior basal margin less convex. With a single extion, the specimens of *L. Bigsbyi* occur in arenaceous beds, while s species is common both to the softer shales and in the coarser ls.

Formation and localities. In soft shales of the Hamilton group, m loose masses of rock at the south end of Seneca lake, and in the arse grits, at Schoharie, N. Y.

LEIOPTERIA TROOSTI.

Leiopteria Troosti, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-rhomboidal; body broadly ovate moderately oblique; height somewhat greater than the length anterior margin, from the wing to about half the height, nearly vertical, curving broadly around the base, and more abruptly rounded behind. Left valve moderately convex, gibbous on the umbo. Right valve unknown. Hinge-line straight, somewhat less than the length of the shell. Beak anterior, acute, prominent, inclined forward, rising above the hinge. Umbonal region gibbous, abruptly limited on the anterior side by the sulcus, and on the posterior side sloping rapidly to the wing. Wing large, flat, triangular, joining the body of the valve below the middle of the height, limited by the gently retral curve of the striæ; margin moderately concave; extremity acute or mucronate.

Surface marked by regular, equidistant, undulating, lamelliform, concentric expansions, which become crowded, finer, and to some extent less undulated on the wing, stronger and very much crowded on the anterior of the shell. The undulations extend forward in an abrupt curve, bending gently backward, and being thus opposite and slightly imbricating, they give an appearance of radiation.

The specimen described has a length of 35 mm., height 37 mm., and hinge-line about 29 mm.

In general aspect, this species resembles *Actinopteria Boydi*, but the body is much less oblique and wider below; the surface is without proper rays; the wing has only fine, crowded, concentric striæ; while in that species the wing is marked with strong radii and a few lines of growth. These comparisons are made from similar casts of the interior of both species.

Formation and locality. In the coarse grits of the upper part of the Hamilton group, in the northern part of Schoharie county, N. Y.

LEIOPTERIA LEAI.

Leiopteria Leai, HALL. Pal. N. Y., vol. v, pt. 1 *Unpublished.*

SHELL small, sub-rhomboidal; body broadly ovate, very moderately oblique; height much greater than the length; margin regularly rounded from above the middle on the anterior side, to a similar point on the opposite side of the valve; post-basal margin slightly produced. Left valve very convex; gibbous from below the middle to the umbo. Right valve unknown. Hinge-line straight, less than the length of the shell. Beak anterior, acute, rounded, inclined forward, prominent. Umbonal region gibbous, subtending an acute angle. Ear short, directed downward, limited by an undefined sulcus, with scarcely any evidence of a byssal sinus. Wing comparatively small, flat, not strongly defined, joining the body of the shell above the middle of its height; margin concave; extremity abruptly acute.

Test marked by fine concentric striæ, which, at intervals, are crowded into fascicles upon the body of the shell, giving an undulating surface. On the wings they are closely and evenly arranged.

One specimen has a length of 20 mm., height 25 mm., and hinge-line about 17 mm. A small specimen has a length of 13 mm., height 15 mm., and hinge-line 12 mm.

This species is more prominent on the umbo and more convex below than any of the forms described in this group; the wing is shorter and smaller, with less extension along the posterior slope. A young shell referred to this species and in the same association has a body less abruptly defined on the posterior side.

Formation and locality. In the coarser grits of the Hamilton group, in the southern part of Schoharie county, N. Y.

LEIOPTERIA GABBI.

Leiopteria Gabbi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL small; body ovate, very slightly oblique; height considerably greater than the length; anterior margin nearly erect for half the height of the valve, and regularly curving to the post-basal margin, which is scarcely produced. Valves sub-equally convex; the greatest convexity being a little above the middle in the left valve, and on the umbo of the right valve. Hinge-line not extended, less than the length of the shell. Beaks acute, prominent, directed forward, anterior to the middle of the shell. Umbonal region gibbous, subtending an acute angle. Ear small, straight on the upper margin; marked by an oblique fold, and separated from the body by an abrupt sulcus and a well-defined byssal sinus. Wing small, triangular, joining the body of the shell below the middle of its height, defined by a change in the direction of the surface striæ; margin gently concave; extremity acute.

Test thin, marked by fine concentric striæ, and at regular intervals by stronger elevated striæ, which give to the macerated shell, and the cast of the interior, a regular banded surface. These stronger striæ are closely arranged on the anterior side and ear, while on the posterior side they preserve their equi-distant character. The right valve is very distinctly marked by the elevated concentric striæ. In both valves there are radiating lines which apparently belong to the structure of the shell. Interior unknown. Ligamental area narrow.

One specimen has a length of 13 mm., height 16 mm., hinge-line about 10 mm. Another example has a length of 12 mm., height 13 mm., and hinge-line about 11 mm.

The small size, erect ovate form, short hinge-line, the proportions of height and length, and the surface characters, distinguish this species from every other form here described.

Formation and localities. In the soft shales of the Hamilton group, shores of Canandaigua lake, and at Norton's Landing, Cayuga lake, N. Y.

LEIOPTERIA OWENI.

Leiopteria Oweni, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 20, fig. 10. Jan., 1883.

SHELL quite large, sub-rhomboidal; body broadly ovate, oblique to the hinge-line; length greater than the height; margins rounded, produced posteriorly. Left valve convex, umbo gibbous, beak elevated. Right valve concave below, flat above, becoming convex toward the beak, which is low and scarcely reaches the hinge. Hinge-line straight, about equal to the length of the valve. Beaks anterior, acute, directed forward. Ear large, extended, defined by a broad sulcus and marked byssal sinus. Wing large, expanded; margin concave; extremity abruptly acute.

Test thin, marked by fine concentric striæ of growth, which on some parts of the surface are crowded into fascicles, producing ridges or undulations. These are somewhat regular over the whole of the left valve, and stronger on the anterior part; on the right valve they are without regularity. The right valve also shows radiating lines which appear to belong to the shell structure, and are quite conspicuous in partially exfoliated specimens. The striæ are crowded and lamellose on the anterior margin and adjacent to the byssal sinus; on the wing they are closely and evenly arranged.

One of the imperfect specimens described has an approximate length of 61 mm., height 55 mm., and hinge-line about 55 mm.; the measurement along the axis of the body, from the beak to the post-basal margin, is 75 mm.

The two specimens observed are crushed, and the characters of the left valve are very much obscured, while the right valve preserves more nearly its true proportions. It differs from the other species of this group in the concave form of the right valve. In surface markings it is very similar to *L. Sayi,* but the concave right valve is a very distinguishing feature. The shell is large and thin, and has suffered compression and distortion in the process of imbedding in the soft shales.

Formation and locality. In the soft shales of the Hamilton group, Canandaigua lake, Ontario county, N. Y.

LEIOPTERIA CHEMUNGENSIS.

Avicula Chemungensis, VANUXEM. Geolog. Surv. N. Y.: Rep. Third Dist., p. 182, fig. 49, No. 3. 1842.

Leiopteria nitida, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, figs. 17, 18. Jan., 1883.

SHELL of medium size or larger, rhomboid-ovate; body elongate-ovate, oblique at an angle of about 60° with the hinge-line; length equal to more than four-fifths of the height; anterior margin nearly vertical for about one-half the height of the shell and broadly rounded on the base; post-basal margin abruptly rounded. Left valve convex, gibbous in the umbonal region. Right valve smaller, less gibbous. Hinge-line straight, a little longer than the height of the shell. Beaks sub-anterior, inclined forward, acute, prominent, arching over the hinge. Umbonal region narrow, prominent, subtending an acute angle. Ear of left valve small, bending slightly downward, defined by a broad distinct sulcus; extremity rounded. Ear of right valve flat. Byssal sinus shallow and broad, deeper in the right valve. Wing broad-triangular, joining the body below the middle of the length, limited by the abrupt bending of the striæ; margin deeply concave in the middle; extremity produced and acute.

Surface, in a partial cast, marked by fine concentric striæ, which are crowded and lamellose on the ear, distinctly marked on the wings, and appearing on the body as distinct undulations; these in the perfect shell may have been sharp lamelliform striæ.

A specimen of the left valve has a length of 30 mm., height 35 mm., hinge-line 47 mm.; the body, from beak to post-basal extremity, measures 43 mm.

The specimen described is the original of *Avicula Chemungensis,* VANUXEM. It resembles *L. Dekayi* of the Hamilton group, but differs in its longer hinge-line, larger wing, and more acute beak, while the body of the shell is narrower.

In the volume of Plates and Explanations this species was referred to *L. Dekayi* in the absence of the original specimen, which has since been compared and found to belong to the Chemung group.

Formation and locality. In a slaty sandstone of the Chemung group, eight miles north of Binghamton N. Y

LEIOPTERIA LINGUIFORMIS.

Leiopteria linguiformis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above medium size, erect, sub-rhomboidal; body elongate-ovate, making an angle of about 60° with the hinge-line; length equal to three-fourths of the height; anterior margin nearly vertical from the byssal sinus to below the middle of the valve; basal margin broadly rounded; post-basal margin rapidly curving into the wing. Left valve convex above, depressed-convex below. Right valve unknown. Hinge-line straight, nearly equal to the length of the shell. Beak acute, erect, prominent, rising above the hinge-line. Umbonal region convex, subtending an acute angle. Ear small, triangular, bending slightly downward, limited by a well-defined byssal depression; margin nearly straight; extremity rounded. Byssal sinus shallow. Wing broad-triangular, joining the body below the middle of the post-cardinal slope, not strongly limited; margin concave; extremity acute.

Surface marked by concentric striæ which are strongly lamellose on the ear, the pallial margins and on the wing. Ligamental area narrow, marked by two or three longitudinal grooves. Muscular impression oval, situated near the middle of the post-cardinal slope.

The specimen described has a length of 33 mm., height 42 mm., and hinge-line 32 mm.

This species differs from *L. Chemungensis* in its more erect form, and the ear is without the strong fold and marked sulcus of that species; the wing is also less extended and the margin less concave.

Formation and locality. In the Chemung group in the valley of Cayuta creek, Broome county, N. Y.

LEIOPTERIA TORREYI.

Leiopteria Torreyi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal, sub-falcate; body narrow-ovate, arcuate, oblique at an angle of less than 45° with the hinge; height equal to about two-thirds of the length; anterior and basal margins broadly curving from the byssal sinus; post-basal margin produced and abruptly recurved. Left valve very convex, gibbous in the middle and above. Right valve unknown. Hinge-line straight, about equal to the height of the valve. Beak sub-anterior, directed forward, acute, prominent and arching over the hinge. Umbonal region narrow, ventricose, well-defined, subtending an acute angle. Ear large, bending downward, marked by a strong oblique fold, limited by a broad, vertical byssal depression and shallow sinus; margin convex; extremity apparently obtuse. Wing joining the body above the posterior extremity limited by the nearly vertical post-umbonal slope which makes a more or less marked sulcus; margin concave; extremity produced, acute.

Surface marked by fine striæ of growth which are somewhat regularly lamellose on the body of the valve.

A left valve has a length of 29 mm., height 22 mm., hinge-line 21 mm.

This species differs from *L. Chemungensis* in its proportionally greater length, narrower umbo, more convex and oblique left valve, and shorter wing.

Formation and locality. In a sandstone and conglomerate of the Chemung group near Panama, N. Y.

LEPTODESMA, HALL.

THE species arranged under the generic designation of LEPTODESMA present a very remarkable assemblage of forms, beginning (as here arranged) with those resembling AVICULA and passing through various phases in form, proportion, etc., until the wing becomes nearly obsolete, the byssal sinus obscure, and the anterior end rounded, and the entire shell assuming the form of MYTILUS or MODIOLA, SANGUINOLITES, MODIOMORPHA and allied genera. For convenience the species have been arranged in natural groups in the following order; *a, spinifera; b, umbonata; c, rostrata; d, patulata; e, arcoidea; f, mytiloidea.*

SECTION *a, spinifera.*

LEPTODESMA MARCELLENSE.

Leptodesma Marcellense, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 17, fig. 12. Jan., 1883.

SHELL small, sub-rhomboidal; body obliquely ovate; height about two-thirds the greatest length; margin regularly rounded, extended posteriorly and continuing in a direct line to the beak. Left valve moderately convex. Right valve unknown. Hinge-line straight, greatly extended posteriorly, reaching beyond the margin of the valve. Beak obtuse, prominent, nearly erect, situated on the anterior third of the hinge. Umbonal region prominent, sloping abruptly on the posterior, not well-defined on the anterior side. Anterior end limited by a shallow, obscure sulcus; margin regularly rounded. Wing narrow-triangular, much extended along the hinge, terminating in a mucronate process; margin deeply and acutely sinuate.

Test thin, marked by fine, closely arranged, concentric striæ, which are more crowded anteriorly; these are crossed by extremely fine radii, which are chiefly confined to the shallow sulcus, anterior to the beak, and are also obscurely marked on the wing. Ligamental area marked by two strong grooves. Two oblique linear depressions along the posterior slope indicate the probable existence of lateral teeth. Other characters of the interior unknown.

This specimen has a length of 11 mm., height 7 mm., hinge-line 12 mm.

This species bears some resemblance to several species in the Chemung group, but it is comparatively narrower and more oblique.

Formation and locality. In the Marcellus shale, Bloomfield, Ontario county, N. Y.

LEPTODESMA ROGERSI.

Leptodesma Rogersi, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 1–9. Jan., 1883.

SHELL of small or medium size, sub-rhomboidal; body ovate, very oblique; length greater than the height; anterior and basal margins broadly rounded; posterior margin extended and abruptly recurved. Valves equally convex above. Right valve somewhat depressed below, comparatively higher than the left. Hinge-line straight, longer than the length of the shell. Beak sub-anterior, obtuse, nearly erect, prominent. Umbonal region gibbous, oblique. The anterior extremity is scarcely alate or auriculate, consisting of a rounded extension, straight above and slightly sinuate at the base. Wing comparatively large, triangular, joining the body of the valve near the posterior extremity, defined by the crowding and curving of the concentric striæ; margin nearly straight for five-sixths of its extent, then acutely recurving; extremity prolonged into a mucronate spine which extends beyond the posterior limit of the valve. In the right valve the wing is less deeply sinuate.

Test thin, marked by closely arranged concentric striæ, which at irregular intervals are crowded into fascicles, producing a gently undulated surface. On the wing the striæ are closely arranged, and just below the hinge-line are turned backward along the spiniform extension of the wing. Ligamental area narrow, having several fine grooves parallel to the hinge.

One specimen has a length from beak to base of 24 mm., height 15 mm., hinge-line about 20 mm. The corresponding right valve has a length of 20 mm., height 15 mm., hinge-line 26 mm. The largest specimen observed has a length of 32 mm., height 21 mm., hinge-line, to the origin of the spine, 20 mm. Small specimens are often less than 10 mm. in length and height.

This species, occurring abundantly in the Hamilton group, closely resembles *Avicula spinigera* of CONRAD, from the Chemung group. In the comparison of large numbers of specimens, the differences are so slight that specific distinction is not always apparent. The Chemung forms are usually more oblique, but this is not a constant character; the wing is smaller and less extended along the posterior slope; the right valve is narrower and more oblique, and the sinus in the margin of the wing is narrower and deeper than in the right valve of the Hamilton form.

Formation and localities. In the shales of the Hamilton group at Norwich, Chenango county, Middleville, Schoharie county, and Leonardsville, Madison county, N. Y.

LEPTODESMA SPINIGERUM.

Avicula spinigera, CONRAD. Jour. Acad. Nat. Sci., Phila., vol. 8, p. 237, pl. 12, fig. 3. 1842.

Pteronites spinigerus (CONRAD), S. A. MILLER. Cat. Amer. Pal. Foss., p. 202. 1877.

Leptodesma spinigerum (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 10–13. Jan., 1883.

SHELL of medium size, sub-rhomboidal; body ovate, oblique to the hinge at an angle of about 45°; length one-third greater than the height; ante-byssal margin truncate at the extremity, curving below into the sinus; basal margin rounded, somewhat abruptly recurved posteriorly. Left valve regularly convex below, gibbous above the middle. Right valve depressed-convex below and abruptly gibbous above. Hinge-line straight (and including the spine), equal to or greater than the length of the shell. Beaks sub-anterior, prominent. Umbonal region abruptly gibbous, subtending an acute angle. Anterior end short, defined by the oblique byssal depression which extends to more than one-third the length of the valve below the beak; extremity obtusely angular. Wing not large, joining the body nearly at the posterior third; margin oblique below, acutely recurved above, the greatest concavity being just below the cardinal extension; extremity produced into a long spiniform process.

Test thin, marked at irregular intervals by strong concentric lamellæ with intermediate fine striæ. The lamellæ are stronger on the anterior side and obscure on the wing. The casts are often nearly smooth.

A specimen of medium size has a length of 29 mm., height 20 mm., hinge-line, to base of spine, 12 mm. A smaller specimen has a length of 20 mm., height 14 mm., hinge-line, to base of spine, 12 mm.

This species closely resembles *L. Rogersi*, but is distinguished by the oblique and more extended byssal depression, shorter wing, and more rounded basal margin.

Formation and localities. In shales of the Chemung group, on the Chemung river above Elmira, and along the Blossburg railroad near Painted Post, N. Y.

LEPTODESMA LONGISPINUM.

Avicula longispina, HALL. Geolog. Surv. N. Y.: Rep. Fourth Dist., p. 262, fig. 3. 1843.

Pterinea longispina (HALL), S. A. MILLER. Cat. Amer. Pal. Foss. 1877.

Leptodesma longispinum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 14, 17–19. Jan., 1883.

SHELL above the medium size, sub-rhomboidal; body elongate-ovate, very oblique; length greater than the height, often nearly double; margin from the byssal sinus to beyond the base broadly rounded; posterior margin extended and abruptly recurved. Valves, in young specimens, sub-equally convex; in older specimens the right valves are somewhat less convex. Hinge-line straight; length equaling or greater than the length of the valve. Beaks anterior, prominent, obtuse, nearly erect, arching over the hinge-line. Umbonal region gibbous, subtending an acute angle. Anterior extension scarcely auriculate, rounded in front, straight above. Wing small, very narrow-triangular; margin deeply sinuate, the bottom of the sinus being close beneath the hinge-line; extremity produced into an elongate spine.

Test thin, marked by fine, irregular, concentric striæ of growth, which are abruptly recurved on the post-cardinal slope, and extend along the margin for nearly half the length of the body before recurving into the wing. The striæ are more elevated and crowded on the anterior side.

The original specimen of this species has a greatest length from beak to base of 42 mm., height 24 mm., hinge-line about 38 mm. A small right valve has a length of 22 mm., height 12 mm., hinge-line 24 mm.

This species resembles *L. Rogersi*, but the shell attains a larger size; the body is more oblique to the hinge-line, and the posterior extremity more abruptly recurved; the wing is smaller and not extending so far down the body of the valve; the sinus is narrower with the deepest portion just beneath the hinge; the spine is stronger and more distinctly defined; the right and left valves are the same in form; the sinus in the wing of the right valve is not so deep as in the left valve, but much deeper than in the right valve of that species.

This form is associated with *Avicula spinigera* of CONRAD, which is a smaller shell, less oblique, narrower, and with a more angular anterior extremity.

Formation and localities. In the Chemung group, at Painted Post, Steuben county, between Corning and Elmira, and at Chemung Narrows, N. Y.

LEPTODESMA SHUMARDI.

Leptodesma Shumardi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body narrow, very obliquely-ovate; length somewhat less than twice the height; margin very broadly curving from the anterior extremity to the base; basal margin rounded and abruptly recurved at the post-basal extremity. Left valve quite convex; the greatest convexity about one-third the length of the valve below the apex. Right valve unknown. Hinge-line straight; length about equal to the height of the shell. Beak sub-anterior, obtuse, prominent and arching over the hinge-line. Umbonal region gibbous, subtending an acute angle. Anterior extremity short, acute, straight above, oblique below. Wing small, narrow-triangular, extending to a point below the middle of the length of the shell; margin concave; extremity acute, probably spiniform.

Test thin, marked by lamellose, often fasciculate striæ, which are more crowded on the anterior side and byssal depression, and more regular and distinct on the wing.

Three specimens of left valves have respectively the following dimensions: length 42, 40 and 36 mm., height 24, 27 and 24 mm., and hinge-line about 26, 24 and 24 mm.

This species differs from *L. longispinum* in the wider and somewhat less oblique body, with more regularly rounded posterior extremity, the sinus in the wing is less acute, and is farther below the cardinal line; also in the absence of the strong posterior spine of that species.

Formation and locality. In the Chemung group, near Elmira, N. Y.

LEPTODESMA ROBUSTUM.

Leptodesma robustum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations. Pl. 21, figs. 15, 16, 20. Jan., 1883.

SHELL large, sub-rhomboidal; body obliquely ovate; length much greater than the height; ante-byssal margin rounded; margin straight below, or scarcely impressed by the sinus, making a broad curve around the base to the post-basal extremity and thence abruptly recurving toward the beak. Left valve gibbous above, regularly convex below the middle; the greatest convexity about one-third the length of the valve from the beak. Right valve moderately convex in the middle, flat below and scarcely gibbous on the umbo. Hinge-line straight, about equal to the length of the shell. Beaks nearly anterior, obtuse, sub-erect, very prominent, rising above the hinge-line. Umbonal region gibbous, prominent, abruptly elevated along the post-umbonal side for more than half the length of the shell, then merged in the general convexity; on the anterior side obscurely limited by a broad undefined depression. Umbonal angle acute. Anterior extremity scarcely auriculate. Wing small, narrow-triangular, extending about half the length of the valve, defined by the curving of the striæ; margin strongly concave, the deepest concavity just below the hinge; cardinal margin thickened and extended into a strong spine. In the right valve the wing is larger and broader, and the sinus less deep; the anterior extremity corresponds with that of the left valve.

Test moderately thick, marked by fine concentric striæ which become more numerous and fasciculate at irregular intervals, producing a slightly undulated surface, crowded and lamellose on the anterior.

A specimen of a left valve has a length, from beak to base, of 43 mm., height 29 mm., and hinge-line, to the base of the spine, 25 mm.

A right valve, referred to this species, has a length of 32 mm., height 27 mm., and hinge-line, exclusive of the spine, 31 mm.

This species is larger and more robust than *L. longispinum*; the body is wider, less oblique, and less abruptly recurving at the post-basal extremity; the wing is larger and the greatest depth of the sinus not quite so near the cardinal line; the striæ do not recurve so abruptly forward on the posterior slope; the right valve is proportionally higher; the wing is less deeply sinuate, and the spiniform extension is shorter. Compared with *L. Mortoni*, the body of the shell is less oblique and more expanded, while the wing is much smaller and the sinus nearer the hinge-line.

Formation and locality. In the middle portion of the Chemung group at Painted Post, Steuben county, N. Y.

LEPTODESMA AGASSIZI.

Leptodesma Agassizi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body broadly ovate, oblique to the hinge-line at an angle of from 50° to 55°; length nearly one-third greater than the height; anterior margin broadly rounded below the byssal sinus; ventral margin regularly curved; more abruptly curved at the post-basal extremity. Left valve moderately convex below, more convex above and gibbous on the umbo. Right valve less convex. Hinge-line straight, about equal to the height of the valve. Beaks sub-anterior, scarcely directed forward, prominent, rising a little above the hinge-line. Umbonal region moderately gibbous, subtending an acute angle. Anterior end large, obtuse, truncate above and curving below into the byssal sinus, limited by an oblique depression which reaches to near the middle of the length of the valve. Wing small, joining the body below the middle; margin oblique below and abruptly concave just beneath the cardinal line, recurving and produced into a short spiniform extension. The right valve is less convex, the wing larger and more extended along the posterior slope.

Test thin, marked by fine, distant, lamellose striæ with intermediate finer lines. The stronger striæ are more conspicuous on the anterior. The partial casts are nearly smooth.

One specimen has a length of 29 mm., height 23 mm., hinge to base of spine, 15 mm. Another example has a length of 26 mm., height 19 mm., hinge to base of spine, 15 mm.

This species bears a general resemblance to *L. spinigerum*, with which it is associated, but the body is more erect and much wider below; the wing is somewhat wider, the spine shorter, and the striæ less strongly marked.

Formation and locality. In the middle portion of the Chemung group, on the Chemung river, between Elmira and Waverly, N. Y

LEPTODESMA PROTEXTUM.

Avicula protexta, CONRAD. Jour. Acad. Nat. Sci., Phila., vol. viii, p. 238, pl. 12, fig. 6. 1842.

Pterinea protexta (CONRAD), S. A. MILLER. Cat. Amer. Pal. Foss., p. 202. 1877.

Leptodesma protextum (CONRAD), HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 22, 23. Jan., 1883.

SHELL small, sub-rhomboidal; body elongate-ovate, very oblique; length nearly twice as great as the height; anterior margin below the byssal sinus, oblique; base broadly rounded and abruptly recurved on the post-basal extremity. Valves sub-equally convex; the greatest convexity is above the middle of the length, becoming less toward the posterior side, which is somewhat depressed. The right valve is apparently a little smaller than the left. Hinge-line straight, about equal to the length of the shell. Beaks near the anterior end of the valve obtuse, rounded, prominent, inclined forward. Umbonal region narrow, gibbous for a short space below the hinge, subtending an acute angle. Anterior end scarcely auriculate, abruptly rounded in the left valve, pointed in the right valve, limited by a broad, undefined depression, which is less marked in the right valve. Byssal sinus shallow. Wing narrow-triangular, joining the body near the posterior extremity of the valve, defined by the direction of the striæ; margin deeply concave, the greatest concavity just beneath the hinge-line; extremity produced into a sharp spine which extends nearly as far as the posterior margin of the shell.

Test thin, marked by concentric striæ of growth, which are crowded into fascicles at irregular intervals, giving a somewhat wrinkled or undulating surface. On the anterior side the striæ are crowded and lamellose, while they are quite regular and closely arranged over the wing. On the external shell the striæ are elevated into regular, equi-distant lamellæ. In the exfoliated shell, or partial casts, the surface presents obscure or obsolescent radii which appear to belong to the intimate shell-structure, and which are not shown on well-preserved specimens.

The largest specimen observed has a length of 26 mm., height 13 mm., hinge-line 20 mm. A similar right valve has a length of 23 mm., height 10 mm., hinge-line 16 mm. The specimens are usually smaller than those figured.

This species resembles in form of body and in the concentric striæ, *L. longispinum;* but the anterior extremity (especially in the right valve) is narrower, the wing is extended farther down the body of the valve, and the spine is less produced. This shell in its usual condition of preservation (that is, having the spiniform process of the wing broken off, or the wing partially covered) presents the characters described by Mr. CONRAD, although not illustrated in his figure. A specimen of this species is labeled in the handwriting of Mr. CONRAD, *Avicula protexta*, and therefore the name is retained.

Formation and localities. In the Chemung group at Chemung Narrows, N. Y., and Tioga county, Pa.

LEPTODESMA BECKI.

Leptodesma Becki, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations; Pl. 22, figs. 3–5 (and figs. 6 and 7 in error). Jan., 1883.

SHELL of medium size, sub-rhomboidal; body oblique, narrowly ovate in the left valve; length more than one-third greater than the height; anterior margin oblique, extending in nearly a direct line into the broadly rounded basal margin; post-basal margin produced, not abruptly recurved into the wing. Left valve gibbous except in the lower part. Right valve less convex. Hinge-line straight, less than the length of the shell, and greater than the height. Beaks at about the anterior third of the hinge-line, obtuse, directed forward and arching over the hinge. Umbonal region gibbous, scarcely defined anteriorly, but well-marked posteriorly by the abrupt slope of the side. Umbonal angle acute. Anterior end truncate, acute at the extremity. Wing of medium size, not distinctly limited, joining the body nearly at the posterior extremity; margin concave; extremity produced into a short spine. The right valve is proportionally higher, the body less distinctly defined, and the wing larger.

Test thin, marked by concentric striæ, which are crowded and somewhat lamellose in front, and closely and evenly arranged on the wing. The hinge-line has a single narrow groove.

A left valve has a length of 28 mm., height 17 mm., hinge-line about 22 mm. A detached right valve has a length of 29 mm., height 20 mm., hinge-line 30 mm.

This species resembles *L. robustum* in general expression and in the sinus of the wing, but the body is narrower, more regularly convex, the base less expanded, and the basal margin and the striæ along the posterior slope are not so abruptly recurved.

Formation and localities. In the Chemung group, near Corning, Chemung county, and Portville, Cattaraugus county, N. Y.

LEPTODESMA DISPARILE.

Leptodesma disparile, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, figs. 2–4. Jan., 1883.

SHELL of small or medium size, sub-rhomboidal; body ovate, oblique to the hinge at about 45°; length more than one-third greater than the height in the left valve; ante-byssal margin oblique, gently curving into the sinus; basal and posterior margins regularly rounded. Left valve convex below, gibbous above. Right valve flat or concave below, depressed-convex in the middle, and gibbous on the umbo. Hinge-line straight, greater than the length of the shell. Beak sub-anterior, prominent, rising above the hinge-line, directed slightly forward. Umbonal region gibbous, subtending an acute angle. Anterior end large, somewhat produced, limited by a nearly vertical byssal depression; extremity obtusely angular. Wing somewhat large, joining the body near the posterior extremity; margin oblique below, concave above the middle, and produced into an elongate spiniform process. The right valve is smaller, the wing more extended and less defined, while the anterior end is large and well-defined by the byssal sinus and sulcus.

Test marked by concentric, lamellose ridges with intermediate finer lines of growth; the lamellæ are sometimes more distinct on the right valve.

A left valve has a length of 28 mm., height 20 mm., hinge-line more than 30 mm. A right valve has a length of 30 mm., height 18 mm., hinge-line 33 mm.

This species is distinguished from *L. Rogersi* and *L. spinigerum* by the large anterior end, narrower umbo, more extended wing, less deeply sinuate margin, less convex right valve, and the regular concentric lamellose ridges of the surface.

Formation and localities. In sandstones of the Upper Chemung group, McKean county, Pa., and Farmers' Valley, Cattaraugus county, N. Y.

LEPTODESMA SOCIALE.

Leptodesma sociale, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 24–28 (33, 34?). Jan., 1883.

SHELL small, sub-rhomboidal; body broad-ovate, oblique; length greater than the height; anterior margin nearly straight and quite oblique; base regularly rounded; post-basal side somewhat extended and abruptly recurved. Left valve convex, gibbous in the upper part, more convex than the right valve, which is moderately convex above and depressed-convex or flat below. Hinge-line straight, sometimes greater than the length of the shell. Beaks at about the anterior third of the hinge-line; the left beak prominent, obtuse; the right beak less conspicuous. Umbonal angle acute. Anterior extremity sub-auriculate, straight above, slightly extended. Wing triangular, joining the body of the valve below the middle of its length (measured from hinge to base); margin regularly concave; extremity produced into a spine, which, in perfect specimens, reaches beyond the margin of the valve. In the right valve the wing is less distinctly defined, and the sinus not so deeply concave.

Surface marked by fine concentric striæ, which at somewhat regular intervals are elevated into sharp, conspicuous lamellæ, or sometimes into fascicles of striæ producing elevations. These become crowded and irregular on the anterior of the valve, and are very regular and uniform on the wing and on the right valve.

A specimen of a left valve has a length of 10 mm., height 7.5 mm., hinge-line about 10 mm. A similar specimen has a length of 11 mm., height 6.5 mm., and hinge-line about 11 mm. A right valve has a length of 9 mm., height 6 mm., hinge-line about 8 mm. Another one has a length of 16 mm., height 11 mm., hinge-line about 16 mm.

This is a small and abundant species, often occurring in great numbers on the surfaces of shaly layers. It is distinguished by its form and the regular lamellose appearance of the surface.

Formation and localities. In the shales of the Chemung group at Conewango, Cattaraugus county, Nanticoke Springs, Broome county, and south of Ithaca, N. Y.

LEPTODESMA POTENS.

Leptodesma potens, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 21, 30; pl. 22, figs. 11, 12, 19, 21. Jan., 1883.

SHELL large, sub-rhomboidal; body ovate, oblique, broad below; length more than one-third greater than the height; ante-byssal margin sub-truncate, erect, oblique below; basal margin broadly curving; posterior margin broad, extended and abruptly recurving at the upper extremity. Left valve convex, gibbous above; the greatest convexity at one-third the height of the shell from the beak. Right valve almost equally convex, more abruptly gibbous on the umbo, and comparatively shorter and wider. Hinge-line straight, about equal to the length of the shell. Beak sub-anterior, obtuse, erect, prominent, arching over the hinge. Umbonal region gibbous, very prominent, limited anteriorly by a shallow depression extending from a point anterior to the beak to the margin at one-third the height of the shell below the hinge-line; posteriorly limited by the abrupt post-cardinal slope. Umbonal angle acute. Anterior extremity extended and angular. Wing large, triangular, joining the body near the posterior extremity, distinctly limited; margin broadly sinuate; extremity produced into a strong spine (the extent of which is unknown).

Surface marked by strong concentric lines of growth, which are crowded into small fascicles at irregular intervals on the body of the shell, and become lamellose expansions on the anterior. On the wing they appear as sharp equi-distant lamellæ. Casts of the interior show the concentric striæ in a subdued condition.

The largest left valve observed has a length, measured from beak to base, of 62 mm., height 46 mm., hinge-line, exclusive of the spine, 58 mm. A smaller specimen has a length of 57 mm., height 39 mm., hinge-line to base of spine, 58 mm. A right valve referred to this species has a length of 36 mm., height 28 mm., and hinge-line, to base of spine, 35 mm.

This species more nearly resembles *L. robustum* than any of the forms here described; but it is larger, the wing proportionally larger and distinctly limited, and the sinus of the wing more central. The right valve is also more convex and the wing more deeply sinuate. It occurs in the upper members of the Chemung group, associated with *Spirifera Verneuili*, while *L. robustum* is found only in the middle of the series. It is a larger and more robust shell than *L. Mortoni*, and the right valves are very unlike.

Formation and localities. In the Upper Chemung group at Olean, Portville, Cassadaga lake, and in loose specimens collected near Panama, N. Y.

LEPTODESMA POTENS, var. JUVENS.

Leptodesma potens, var. *juvens*, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 16. Jan., 1883.

SHELL small, rhomboidal; body ovate, oblique; the greatest length more than once and a half the height; anterior margin oblique, very broadly curving below; post-basal extremity rounded and abruptly recurved. Left valve convex below, very gibbous and ventricose in the middle and above. Right valve unknown. Hinge-line straight, less than the length of the shell. Beak obtuse, situated at the anterior third of the hinge-line, prominent, arching over the hinge-line and inclined slightly forward. Umbonal region ventricose, obscurely limited anteriorly by an undefined depression, and on the posterior side by the abrupt and almost vertical post-umbonal slope. Umbonal angle acute. Anterior end short, triangular; extremity acute. Wing broad, triangular, joining the body of the shell near the posterior end; margin regularly concave; extremity acute.

Test thin, marked by extremely fine, regular concentric striæ, which are crowded into fascicles on the anterior end.

The specimen described has a greatest length of 25 mm., height 15 mm., hinge-line 22 mm.

This shell resembles *L. potens*, but it is apparently more extended and acute in front, sub-truncate on the posterior end; the wing joins the body near the posterior extremity, and its margin is less deeply sinuate than *L. potens*. These variations appear in comparison with the older individuals of that species, and cannot be taken as positive evidence of specific difference, while at the same time their common characters may be insufficient to unite them.

Formation and locality. In the Chemung group at East Randolph, Cattaraugus county, N. Y.

LEPTODESMA MORTONI.

Leptodesma Mortoni, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 29, 31, 32 (pl. 22, fig. 20 in error). Jan., 1883.

SHELL above the medium size, sub-rhomboidal; body elongate subovate, very oblique; length more than one-half greater than the height; ventral margin broadly curving to the base; the posterior margin extended and abruptly recurved. Left valve convex, gibbous above. Right valve depressed-convex below, and abruptly gibbous at the umbo. Hinge-line straight; length less than the length of the shell. Beaks sub-anterior, obtuse, erect, prominent, arching over the cardinal line. Umbonal region gibbous and gradually sloping down to the general convexity, abruptly limited on the posterior side, subtending an acute angle. Anterior end extended, acute and nasute. Wing large, triangular, slightly convex, joining the body of the shell more than two-thirds of the length below the beak; margin symmetrically concave; extremity produced and very acute. In the right valve the anterior end is broad and flat; the wing is large, with no defined limit between it and the body of the valve.

Surface marked by elevated concentric striæ which, at irregular intervals, are fasciculate, producing undulations on the surface. This character is often marked on the front of the shell where the fascicles are composed of three or four distinct striæ.

A specimen of the left valve has a length, measured from beak to base, of 44 mm., height 30 mm., hinge-line about 38 mm. Another example has a length of 45 mm., height 25 mm., hinge-line 32 mm. A right valve measures 43 mm. in extreme length, height 30 mm., hinge-line about 34 mm.

This species bears some resemblance to *L. robustum*, but the body is more oblique and not so broad below; the anterior extremity is acute; the wing larger, more extended along the valve and very symmetrically concave on the margin. The form of the shell is very similar to *L. longispinum*, but differs by its larger wing, the broader sinus and more regularly rounded posterior extremity, and in the latter respect it resembles *L. Shumardi*, while it is otherwise very different.

Formation and localities. In the Chemung group at Portville, Cattaraugus county, and Little Genesee, Alleghany county, N. Y.

LEPTODESMA BILLINGSI.

Leptodesma Billingsi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, sub-rhomboidal; body elongate-ovate, or sub-cylindrical, very oblique; length about twice the height; ante-byssal margin rounded, becoming straight or slightly concave at the sinus; ventral margin broadly curving; posterior margin extended, acutely recurved at the post-basal extremity. Left valve gibbous on the umbo, convex below. Right valve unknown. Hinge-line straight; length, including the spine, nearly equal to the length of the valve. Beak sub-anterior, obtuse, slightly oblique, prominent. Umbonal region somewhat gibbous, subtending an acute angle. Anterior end limited by a shallow byssal depression, acute and nasute at the extremity. Wing long, narrow-triangular, extending below the middle of the valve; margin sinuate; extremity produced into a spine.

Test thin, marked by fine concentric striæ which are abruptly arched on the posterior slope, regular upon the wing, and crowded into fine irregular fascicles which are conspicuous on the anterior. Some specimens show sharp, elevated, lamellose striæ at equal distances on the surface of the body. The surface characters vary with the different states of exfoliation and maceration.

The largest specimen observed has a greatest length, from beak to base, of 57 mm., height 36 mm., hinge-line, to base of spine, 35 mm. A small example of the left valve has a length of 34 mm., height 18 mm., and hinge-line about 35 mm.

This species is more elongate and oblique than *L. longispinum*, the wing extends farther down along the posterior slope, and the anterior extremity is fuller and more acute.

Formation and localities. In the Chemung group at Panama, N. Y. Other specimens from near Elmira, N. Y., and Mansfield, Tioga county, Pa., are referred to this species with reservation.

LEPTODESMA MATHERI.

Leptodesma Matheri, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, figs. 8–10. Jan., 1883.

SHELL of medium size, rhomboidal; body ovate, oblique at an angle of 45° with the hinge-line; length about one-half greater than the height; ante-byssal margin vertical in front, joining the broad curvature of the byssal margin; posterior margin produced and abruptly recurved. Left valve moderately convex below, scarcely gibbous above. Right valve shorter and less convex. Hinge-line straight; length much less than the length of the valve, but nearly equal to the height. Beaks at about the anterior third of the hinge, obtuse, directed slightly forward, not very prominent. Umbonal region moderately gibbous, subtending an acute angle. Anterior end produced, flattened, acute at the extremity. Wing of moderate dimensions, extending nearly to the posterior extremity; margin gently concave; extremity produced and acute.

Test thin, marked by fine concentric striæ which are fasciculate on the body of the shell, producing an undulated appearance. The striæ are sub-lamellose on the anterior and regular over the wing.

A left valve has a length of 35 mm., height 23 mm., and hinge-line about 28 mm. A similar right valve has a length of 29 mm., and height 20 mm.

This species differs from *L. robustum* in its comparatively larger wing, without distinct sinus in the margin, and the more produced anterior end. It resembles *L. potens*, but differs in its more produced anterior end, less gibbous body, and more abruptly recurved posterior margin.

Formation and locality. In the upper beds of the Chemung group, near Bradford, McKean county, Pa.

LEPTODESMA STEPHANI.

Leptodesma Stephani, HALL. Pal. N. Y., vol v. pt. 1. *Unpublished.*

SHELL above the medium size, sub-rhomboidal; body ovate, straight on the post-umbonal slope, oblique at an angle of from 30° to 40° with the hinge-line; height about five-eighths of the length; ante-byssal margin vertically truncate above, curving below into the sinus; basal margin broadly rounded, abruptly recurved at the post-basal extremity. Left valve convex, somewhat gibbous above. Right valve depressed-convex below and abruptly gibbous at the umbo. Hinge-line straight, about five-sixths the length of the valve. Beaks sub-anterior, directed slightly forward, obtuse, prominent, rising a little above the cardinal line. Umbonal region regularly gibbous, subtending an acute angle. Anterior end large, short, defined by a nearly vertical byssal depression, which reaches the margin about one-third the length of the valve from the anterior extremity, which is abruptly rounded or truncate. Wing joining the body at less than one-fourth the length of the valve from the posterior extremity; margin very oblique below, deeply concave above; the greatest depth of the concavity is above the middle, whence the margin is abruptly recurved and produced into a spiniform extension.

Test of moderate thickness, marked by nearly equi-distant lamellose concentric striæ, with intermediate finer striæ of growth. The lamellose striæ are subdued upon the wing, and very strong and irregular on the anterior side.

A large specimen of this species has a length of 43 mm., height 25 mm., and hinge-line about 33 mm. A somewhat smaller example has a length of 37 mm., height 25 mm., and hinge-line 30 mm. A right valve measures 33 mm. in length, 24 mm. in height, and hinge-line 28 mm.

This species resembles *L. Matheri*, with which it is associated, but differs in its greater obliquity, more elongate outline, more extended and flatter wing, which is more deeply concave on the margin and with the extremity more produced; the anterior extremity is also larger and apparently not produced. The right valves of the two species are very unlike.

Formation and localities. In the Upper Chemung group at Bradford, Pa., and doubtfully occurring near Elmira, N. Y.

LEPTODESMA LEPIDUM.

Leptodesma lepidum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, fig. 40. Jan., 1883.

SHELL of medium size, narrow, sub-rhomboidal; body narrowly ovate, somewhat straight on the posterior slope, oblique at an angle of about 35° with the hinge-line; length less than twice the height; margin very oblique anteriorly, curving into a marked byssal sinus; base broadly rounded to the posterior extremity, which is abruptly recurved. Left valve regularly convex below, gibbous above. Right valve very depressed-convex, nearly flat below, moderately convex on the umbo, considerably smaller than the left. Hinge-line straight; length more than two-thirds the greatest length of the shell. Beaks sub-anterior, directed forward, prominent in the left valve, depressed in the right valve. Umbonal region narrow and abruptly gibbous in the left valve; depressed and scarcely defined in the right. Umbonal angle about 30°. Anterior end small, acute at the extremity, limited by a distinct vertical byssal depression. Wing narrow-triangular, joining the body at about one-fourth the length from the posterior extremity; margin deeply concave, abruptly recurved along the cardinal line, and extended into a spiniform process. In the right valve the wing is scarcely defined.

Test marked by very fine concentric striæ, which are regular upon the body and wing, and crowded and fasciculate on the anterior. In the right valve the striæ are more distant and more even in their character.

A left valve of medium size has a length of 41 mm., height 22 mm., length of the cardinal line about 35 mm.

This species differs from *L. Hector* in its greater obliquity, broader body below, more produced and abruptly recurved post-basal extremity, deeper and broader byssal depression, more produced anterior end, and narrower and more deeply sinuate wing, with a more extended extremity.

Formation and localities. In the central portion of the Chemung group at Philipsburg, Alleghany county, N. Y., and below the conglomerate (same position) in Sullivan township, Tioga county, Pa.

LEPTODESMA CURVATUM.

Leptodesma curvatum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, fig. 5. Jan., 1883.

SHELL above the medium size, rhomboidal; body ovate, sub-arcuate above, oblique at an angle of nearly 30° with the hinge-line; length and height as 7 to 4; ante-byssal margin oblique above, curving into a long, shallow sinus; basal and posterior margins forming a broad, continuous curve, and abruptly recurving at the post-basal extremity. Left valve regularly convex below, gibbous above the middle. Right valve unknown. Hinge-line straight; length about equal to the length of the valve, but not fully seen, as the spiniform termination is imperfect. Beak sub-anterior, prominent, directed forward. Umbonal region gibbous, subtending an acute angle. Anterior end large, abruptly acute at the extremity, limited by a distinct, nearly vertical byssal depression. Wing narrow-triangular, joining the body at the posterior extremity; margin very oblique below, concave above, abruptly recurved just below the cardinal line and extended into a spiniform process. In a cast of the left valve the wing is distinctly separated from the body by a marked furrow.

Test moderately thick, marked by elevated lamellose striæ, with finer intermediate lines.

The specimen described has a length of 42 mm., height 24 mm., hinge-line, to base of spine, 30 mm. The spine is probably extended from 5 to 10 mm. beyond.

This species resembles *L. lepidum*, but differs in its more gibbous form, larger and more obtuse anterior extremity.

Formation and localities. In sandstones of the Upper Chemung group, McKean county, Pa., on the road from Bradford to Farmers Valley, Cattaraugus county, N. Y.

SECTION *b*, *umbonata.*

LEPTODESMA MEDON.

Leptodesma Medon, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body broad-ovate, oblique at an angle of about 60° with the hinge-line; length nearly one-third greater than the height; ante-byssal margin curving slightly outward, concave at the sinus; basal and posterior margins broadly rounded, passing directly into the wing. Left valve gibbous above, depressed-convex below. Right valve somewhat less convex than the left. The right valve appears to have been somewhat smaller and the base more extended than in the left valve. Hinge-line straight; length a little greater than the height of the shell. Beaks at about the anterior third of the hinge, acute, prominent, arching over the hinge-line. Umbonal region gibbous, descending almost vertically on the posterior, and sloping abruptly on the anterior side. Umbonal angle acute. Anterior end short, separated from the body by a marked sinus; extremity angular, gently rounded below. Wing not defined, broad-triangular, reaching nearly to the posterior end of the body; margin slightly concave; extremity acute.

Test thin, marked by concentric striæ, which, on the body of the shell, are crowded into fascicles and assume a distinct regularity in passing over the wing. The hinge shows one or two slender parallel grooves.

Three similar specimens of the left valve have respectively the following dimensions: length 32, 32 and 33 mm., height 22, 25 and 23 mm., and hinge-line 25, 27 and 25 mm.

In this species the body of the shell resembles *L. robustum* and *L. potens,* but is less oblique to the hinge-line, the wing less defined, and its posterior extremity not produced into a spine.

Formation and locality. In the upper part of the Chemung group, Lawrenceville, Tioga county, Pa.

LEPTODESMA UMBONATUM.

Leptodesma umbonatum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 13. Jan., 1883.

SHELL of medium size, rhomboidal; body oblique, narrowly ovate; greatest length one-half more than the height; ante-byssal margin straight or slightly convex, curving into the wide sinus, oblique below; ventral margin broadly rounded; posterior extremity moderately produced, abruptly recurved. Left valve convex, ventricose above the lower third. Right valve unknown. Hinge-line straight; length less than the length of the shell. Beak at about the anterior third of the cardinal line, directed slightly forward, prominent and arching over the hinge. Umbonal region narrow and ventricose, defined anteriorly by a broad, shallow depression, which is nearly vertical to the hinge-line, and posteriorly by the abrupt depression of the body. Anterior end acute, triangular. Wing rather large, triangular, convex, joining the body of the shell near the posterior extremity; margin broadly concave; extremity produced, acute.

Test thin, marked by fine concentric lines of growth which are irregularly crowded into small fascicles, producing a slightly undulated appearance. The striæ are strong and regular over the wing.

The left valve described has a length of 41 mm., height 27 mm., hinge-line about 38 mm.

This species bears some general resemblance to *L. potens* and *L. robustum*, but the body is narrower, less oblique and much more gibbous, the beak more elevated, and the posterior extremity of the body less expanded. The wing is also much larger than in *L. robustum*. It is very closely allied to *L. umbonatum* var. *depressum*, but differs in its smaller mucronate anterior end; the body is more convex and narrower below, and the extremity of the wing more produced.

Formation and locality. In a calcareous band of the upper part of the Chemung group, Twenty-mile creek, Chautauqua county, N. Y.

LEPTODESMA UMBONATUM, var. DEPRESSUM.

Leptodesma umbonatum, var. HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 14. Jan., 1883.

SHELL of medium size, rhomboidal; body very oblique-ovate; length once and a half greater than the height; ante-byssal margin, below the acute extremity, regularly curving into the ventral margin; posterior extremity produced, with the margin gently recurving into the wing. Left valve convex below, gibbous above. Right valve smaller, a little less convex, abruptly gibbous on the umbo. Hinge-line straight, somewhat less than the greatest length of the shell. Beaks sub-anterior, obtuse, directed slightly forward, very prominent, arching over the hinge-line. Anterior end short, large, limited by a broad, undefined depression; extremity produced, acute. Wing large, triangular, not distinctly defined, joining the body near the posterior end; extremity produced, acute, and probably extended into a short spine.

Test marked by fine striæ of growth which are irregularly fasciculate, producing a slight undulation of the surface. The striæ are lamellose on the anterior side and regular on the wing.

The specimen described has a greatest length of about 40 mm., height 25 mm., and hinge-line 35 mm.

This form differs from *L. umbonatum* in the lesser convexity and greater width of the lower part of the body; less abrupt depression on the anterior side from the umbo; the posterior slope less elevated and defined below the middle, and a much larger ante-byssal portion of the shell.

Formation and locality. In the upper part of the Chemung group, Napoli Centre, Cattaraugus county, N. Y.

LEPTODESMA NAVIFORME.

Leptodesma naviforme, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 15; pl. 23, fig. 1. Jan., 1883.

SHELL below the medium size, rhomboidal; body very oblique, short-ovate; length more than one-third greater than the height; anterior extremity subtruncate; margin curving to the broadly rounded base; posterior margin slightly produced, gently curving forward, nearly vertical. Left valve convex below, very gibbous above the middle. Right valve depressed-convex below, gibbous above. Hinge-line straight, more than one-third greater than the height of the shell. Beaks obtuse, situated at the anterior fourth of the hinge-line, prominent, directed slightly forward. Umbonal region gibbous, sloping abruptly into the wing. Anterior end short, acute. Wing large, not distinctly limited, extending almost to the posterior extremity; margin scarcely concave below; extremity produced, acute.

Test marked by fine concentric striæ, which are crowded into fascicles at nearly equal intervals, rounded upon the upper part of the body, and sub-angular on the lower part. The striæ are crowded and lamellose on the anterior; on the posterior slope they make a short abrupt curve, passing over the wing with a gently forward direction and curving backward just below the hinge-line. In the weathered surface of the right valve the concentric undulations are stronger, the post-cardinal slope is marked by strong interrupted radii which appear to belong to the intimate structure of the shell. The hinge is marked by a single narrow groove.

A specimen of the left valve has a length of 22 mm., height 14 mm., and hinge-line about 21 mm. A right valve occurring in the same association has a length, from beak to base, of 26 mm., height 18 mm., and hinge-line about 25 mm.

This species is quite unlike any here described.

Formation and locality. In the lower beds of the Chemung group at the Inclined Plane, near Ithaca, N. Y.

LEPTODESMA CADMUS.

Leptodesma Cadmus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body oblique, narrowly ovate or sub-cylindrical; length nearly one-third greater than the height; ante-byssal margin somewhat vertically truncate, sloping below into the broadly curving base; posterior margin abruptly curved. Valves convex, gibbous above; the right valve smaller than the left. Hinge-line straight, nearly equal to the height of the shell. Beaks at about the anterior third of the hinge-line, acute, directed forward, prominent, arching over the cardinal line. Umbonal region abruptly gibbous, subtending an acute angle. Anterior end small, terminating in a narrow nasute extension. Wing comparatively large, triangular, joining the body near the posterior end; surface concave; margin gently sinuate; extremity produced into a short spiniform extension.

Test thin, marked by fine concentric striæ, which are somewhat regularly fasciculate on the body of the shell, crowded and sub-lamellose on the anterior, and regular over the wing, curving backward just below the hinge, indicating a spiniform extension of the wing. On the body of the right valve the striæ form sharp, lamellose elevations at somewhat equal intervals. The hinge is marked by one or two narrow longitudinal grooves.

A left valve has a length of 34 mm., height 24 mm., and hinge line 22 mm. A similar specimen, somewhat vertically compressed, has a length of 36 mm., height 24 mm., hinge-line 25 mm.

This species resembles *L. umbonatum var. depressum*, but differs in its smaller and narrower anterior end and more cylindrical body, and wing without a broad sinus in the margin.

Formation and localities. In the upper beds of the Chemung group, Steuben county, N. Y., and Tioga and Bradford counties, Pa.

LEPTODESMA CREON.

Leptodesma Creon, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL below medium size, sub-rhomboidal; body ovate, oblique to the hinge-line at an angle of about 55°; length nearly one-third greater than the height; ante-byssal margin slightly oblique or rounded, distinctly sinuate below, then gently curving to the broad base; posterior margin broad, joining the wing without interruption.

Left valve convex below, gibbous above. Right valve less gibbous than the left and more expanded. Hinge-line straight; length a little greater than the height of the shell. Beaks at about the anterior third of the hinge-line, sub-acute, directed forward, prominent, arching over the hinge. Umbonal region very gibbous, narrow, limited by the abrupt slope of the posterior side. Umbonal angle acute. Anterior end large, short, rounded, curving into the byssal sinus, defined by a marked byssal depression; extremity acute. Byssal sinus marked by a broad, shallow curvature of the margin. Wing small, narrow-triangular, not distinctly limited; margin concave; extremity acute. The wing of the right valve is comparatively larger.

Test thin, marked by fine concentric lines of growth, which are sometimes regular or often crowded into fascicles on the body of the shell. Cardinal line marked by a narrow longitudinal groove.

A left valve has a length of 32 mm., height 21 mm., hinge-line 23 mm. A smaller specimen has a length of 29 mm., height 20 mm., hinge-line 22 mm.

This species resembles in general expression *L. umbonatum var. depressum*, but it is uniformly smaller, the anterior end shorter, byssal depression narrower, wing smaller, the recurving of the posterior margin of the body less abrupt, the limits of the wing less distinctly marked, the extremity less produced, and the umbonal region not so abruptly gibbous.

Formation and locality. In the upper part of the Chemung group, Lawrenceville, Tioga county, Pa.

LEPTODESMA DEMUS.

Leptodesma Demus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body very oblique, narrowly ovate; extreme length more than one-third greater than the height; ante-byssal margin oblique, rounded below, concave at the sinus; basal margin broadly rounded; posterior margin abruptly curved. Left valve convex, gibbous above. Right valve of similar form, less convex, and in the posterior part wider and more depressed. Hinge-line straight, about two-thirds as long as the length of the valve. Beaks situated at about the anterior third of the hinge, prominent, directed forward and rising a little above the cardinal line. Umbonal region gibbous, defined on the anterior by the byssal depression, and on the posterior by the slope of the side. Anterior end large, limited by an oblique byssal depression, angular at the extremity and rounded below. Byssal sinus extending to a point more than one-third the height of the valve below the beak. Wing narrow-triangular, not distinctly limited; margin oblique, slightly convex, recurving just below the hinge-line; extremity angular.

Test marked by fine, irregular striæ, somewhat fasciculate on the body, and crowded and lamellose in front.

A well-preserved left valve has a length of 35 mm., height 20 mm., hinge-line nearly 24 mm.

The body of the valve in this species is narrower and more elongate than in *L. Creon*, and the wing smaller and less distinctly defined. It resembles *L. Lichas*, but differs in its more gibbous umbo, stronger byssal depression, less oblique margin of the wing, with less acute termination and proportionally shorter body.

Formation and locality. In sandstones of the Chemung group at Lawrenceville, Tioga county, Pa.

LEPTODESMA LOXIAS.

Leptodesma Loxias, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body ovate, narrow above, oblique to the hinge-line at an angle of about 40°; height one-third less than the length; ante-byssal margin oblique, rounding into the sinus; ventral margin broadly rounded; posterior margin abruptly recurved. Left valve convex, gibbous in the middle and above. Right valve unknown. Hinge-line straight, greater than the height of the shell. Beak obtuse, prominent, arching over the cardinal line, situated at the anterior third of the hinge. Umbonal region narrow and gibbous, subtending an acute angle. Anterior end limited by a broad, nearly vertical byssal depression which extends one-half the height of the valve; margin convex; extremity acuminate. Wing triangular, not distinctly limited, joining the body near the posterior extremity; margin oblique, nearly straight, concave just beneath the hinge-line; extremity mucronate.

Test thin, marked by fine concentric striæ, which are regular over the body and wing and strongly lamellose and fasciculate on the anterior end.

A small left valve has a greatest length of 28 mm., height 17 mm., hinge-line 21 mm.

This species is distinguished from *L. Creon* and *L. Demus* by its narrower anterior end and more rounded ventral margin.

Formation and locality. In the Chemung group, Lawrenceville, Tioga county, Pa.

LEPTODESMA MENTOR.

Leptodesma Mentor, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body elongate-ovate, narrow at the anterior end, oblique, making an angle of about 40° with the hinge-line; length one-third greater than the height; ante-byssal margin oblique, curving into the gently depressed sinus; basal margin broadly curving into the rounded posterior extremity. Left valve moderately convex in the lower part, becoming convex in the middle and gibbous above. Right valve unknown. Hinge-line straight; length about equal to the height of the valve. Beak sub-anterior, directed forward, acute, but little elevated above the hinge-line. Umbonal region abruptly, or sub-angularly gibbous, narrow, subtending an acute angle. Anterior end small, narrow, limited by an oblique byssal depression which reaches about half way down the body of the shell; extremity pointed. Wing joining the body near the post-extremity of the shell, defined by a shallow groove; margin oblique, straight, apparently slightly concave just below the cardinal line.

Test thin, leaving upon the cast the marks of the striæ of growth which have been somewhat fascicled upon the body, giving it an obscurely undulated appearance.

A specimen of this species has a length of 35 mm., height 24 mm., and hinge-line nearly 24 mm.

This species resembles *L. Orodes*, but differs in its greater obliquity; the body is more attenuate toward the anterior, and the wing is distinctly limited. This one, and several other species, have shown the presence of an alar furrow and obscure fold, similar to PTYCHOPTERIA.

Formation and locality. In a coarse sandstone of the Upper Chemung group, south of Smethport, McKean county, Pa.

LEPTODESMA ORODES.

Leptodesma Orodes, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, figs. 6, 9 (10?). Jan., 1883.

SHELL of medium size, sub-rhomboidal; body ovate, oblique to the hinge-line at an angle of about 55°; length one-fifth greater than the height; ante-byssal margin a little oblique, nearly vertical above, curving into a long, undefined sinus; ventral margin rounded into the broad posterior curve. Left valve moderately convex in the lower part, increasing in convexity to the middle of the length, where it becomes gibbous. Right valve unknown. Hinge-line straight, a little less than the height of the valve. Beak sub-anterior, directed forward, moderately prominent, scarcely rising above the cardinal line. Umbonal region abruptly gibbous, subtending an angle of about 30°. Anterior end short in the direction of the hinge-line, separated from the body by a well-marked byssal depression extending for half the length of the valve; extremity abruptly angular. Wing large, joining the body below the middle of its length, obscurely defined from the body of the valve; margin moderately oblique, nearly straight, or slightly convex below, with a very gentle concavity just beneath the cardinal line.

Test thin; casts of the interior obscurely marked by fine striæ of growth which are sometimes fasciculate upon the body of the shell.

An individual of medium size has a length of 32 mm., height 27 mm., and hinge-line 23 mm. A smaller example has a length of 25 mm., height 20 mm., and hinge-line 18 mm.

This species is distinguished from *L. Maclurii* by its shorter form, less parallel sides of the body, larger wing, which is not extended on the cardinal margin, and the body is not angular along its entire length.

Formation and locality. In a coarse sandstone of the Upper Chemung group, on the road from Olean, N. Y., to Smethport, Pa.

SECTION *c*, *rostrata*.

LEPTODESMA EXTENUATUM.

Leptodesma extenuatum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 23. Jan., 1883.

SHELL of medium size, elongate, semi-ovate; body narrowly ovate and oblique to the hinge-line at an angle of about 30°; length nearly twice the height; ante-byssal margin very oblique, scarcely depressed at the sinus, thence nearly straight to the broadly curved base; posterior margin abruptly recurved. Left valve moderately convex below, gibbous on the umbo. Right valve flat below, depressed-convex in the middle, and more convex above, proportionally wider than the left, and distinguished by its depressed-convex form. Hinge-line straight; length greater than the length of the valve. Beak of left valve sub-anterior, acute, directed forward, rising slightly above the hinge-line. Beak of right valve depressed, not rising above the cardinal line. Umbonal region of left valve moderately gibbous, subtending a very acute angle. Anterior end greatly extended, acute, rostrate, limited by a shallow byssal depression. Wing narrow-triangular, joining the body at the posterior extremity; defined by the recurving of the striæ; margin abruptly and symmetrically concave, extremity produced beyond the posterior limit of the shell.

Test thin, marked by fine, sharp, closely arranged, concentric striæ, sometimes fasciculate upon the body and anterior side, and very distinct upon the wing. Partial casts of the interior of the left valve give indications of fine radii which appear to belong to the intimate structure of the shell.

A left valve has a length of 32 mm., height 16 mm., and hinge-line 37 mm. A right valve has a length of 34 mm., height 19 mm., and hinge-line 40 mm.

This species is distinguished by the great length of the hinge-line, its narrow outline, and anterior extension. It approaches PTERONITES in character, but differs in having a distinct wing, more depressed form, and a recurvation of the striæ along the post-umbonal slope.

Formation and localities. In the Chemung group, Philipsburg, Alleghany county, N. Y., and Kelly's creek, Tioga county, Pa.

LEPTODESMA HECTOR.

Leptodesma Hector, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body narrowly elongate-ovate, oblique at an angle of about 30° with the cardinal line; length a little more than once and a half the height; ante-byssal margin oblique, curving into a broad, shallow sinus; ventral margin broadly curved; posterior margin abruptly recurved. Left valve moderately convex below, narrowly gibbous above. Right valve depressed below, gently convex above. Hinge-line straight; length equal to about four-fifths of the length of the valve. Beak sub-anterior, directed forward, acute, slightly elevated above the hinge. Umbonal angle very acute. Anterior end narrow, small, produced into an acute extension, defined by a shallow byssal depression. Wing large, joining the body at three-fourths or more of its length from the beak; margin very oblique below, deeply sinuate just beneath the cardinal line, turning abruptly backward and terminating in a spiniform extension. The wing of the right valve is scarcely defined, and the shell has a somewhat broadly spatulate aspect.

Test thin, marked by fine, close, concentric striæ, and, as usually seen, the surface shows nearly equally distant lamellose striæ on the body and wing, which are crowded on the anterior side and extension. In the right valve these characters are more subdued on the body than on the wing. In ordinary conditions, the specimens mostly exhibit only obscure indications of the striation of the shell. Muscular impression in the right valve large, sub-circular, placed below the middle of the length of the posterior slope.

A left valve, of the usual size, has a length of 35 mm., height 20 mm., hinge-line 27 mm. A small specimen has a length of 20 mm., height 12 mm., and hinge-line 16 mm. Young shells of this species are more gibbous than the older examples.

This species resembles, in its general form, *L. extenuatum*, but the body is narrower at the beak, the wing less extended, and the greatest concavity of the margin is just below the cardinal line; while in that species it is near the middle; the anterior extremity is also less prolonged.

Formation and locality. In the upper shales of the Chemung group near Canton, Bradford county, Pa.

LEPTODESMA CLITUS.

Leptodesma Clitus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, narrowly sub-rhomboidal; body elongate-ovate, oblique to the hinge-line at an angle of about 30°; length less than twice the height; ante-byssal margin very oblique; ventral margin broadly rounded, somewhat abruptly recurved at the post-basal extremity. Left valve depressed-convex below, convex above, moderately gibbous on the umbo. Right valve unknown. Hinge-line straight, less than the greatest length of the shell. Beak sub-anterior, directed forward, moderately prominent. Umbonal region gibbous, subtending an acute angle. Anterior end narrow, prolonged into a rostrate extension, defined by a strong byssal depression. Wing narrow-triangular, joining the body near the posterior end, defined only by the abrupt recurving of the striæ; margin deeply and abruptly concave, the deepest concavity about the middle; the extremity is an acute extension of the cardinal line.

Test thin, marked by fine concentric striæ, which are fasciculate upon the body, leaving the cast marked by gentle undulations, which are lamellose and elevated on the anterior side and rostral extension, and elevated on the wing.

A left valve has a length of 37 mm., height 20 mm., hinge-line 32 mm.

This species differs from *L. extenuatum* in its broader body, shorter hinge-line, and narrower wing; the striæ bend more abruptly forward along the post-cardinal slope, and the wing margin is more deeply concave.

Formation and localities. In shales of the Chemung group at Kelly's creek and Mansfield, Tioga county, Pa.

LETPODESMA TRUNCATUM.

Leptodesma truncatum, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-rhomboidal; body ovate-elongate, oblique to the hinge-line at an angle of about 35°; length two-thirds greater than the height; ante-byssal margin oblique and often abruptly truncate, curving into the sinus; broadly rounded along the ventral margin, and more rapidly curving on the post-basal margin. Left valve gently convex below, becoming more convex above, and somewhat gibbous on the umbo. Right valve less convex, flat in the lower part. Hinge-line straight, nearly as long as the length of the shell. Beak sub-anterior, directed forward; in the left valve somewhat prominent; in the right valve not elevated above the hinge-line. Umbonal angle acute. Anterior end obtuse, truncate, abruptly angular at the cardinal margin, limited by a slightly oblique byssal depression. Wing large, triangular, joining the body at the posterior extremity; margin sloping gently forward for two-thirds of the width, then abruptly recurved and extended in an acute or spiniform process. In the right valve the wing is less defined, and the anterior end is more strongly truncate.

Test thin, marked by sharp, elevated, distant, concentric striæ, with intermediate finer lines of growth. The stronger striæ are regular upon the wing and posterior part of the shell, fasciculate on the anterior side, and stronger and lamellose on the anterior extremity.

A left valve has a length of 38 mm., height 22 mm., and hinge-line 37 mm.

This species may be known by its truncate anterior end. The form of the body is very similar to *L. extenuatum*, but it is somewhat more convex and a little wider; the wing margin is less concave and the extremity less extended. The right valves of these two species are conspicuously different.

Formation and locality. In the central portion of the Chemung group, Mansfield, Tioga county, Pa.

EPTODESMA CORYDON.

Leptodesma Corydon, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-rhomboidal; body narrowing very rapidly toward the beak, oblique to the hinge-line at an angle of about 30°; length less than twice the height; ante-byssal margin oblique, nearly straight, slightly impressed at the sinus, broadly curved at the base and rounded on the posterior extremity. Left valve depressed-convex below and slightly gibbous on the umbo (as preserved in thinly laminated shale). Right valve unknown. Hinge-line straight, about equal to the greatest length of the shell. Beak sub-anterior, directed forward, little elevated above the cardinal line. Umbonal region moderately gibbous, subtending an acute angle. Anterior end narrow, rostrate, acute, extended, defined by a distinct, shallow, byssal depression which produces a long, gentle curvature in the margin of the valve. Wing narrow, joining the body at nearly the posterior extremity; margin abruptly recurved below and somewhat deeply concave a little below the cardinal line; extremity forming a spiniform extension.

Test thin, marked by fine concentric striæ, which are fasciculate on the body at unequal distances, and sharply elevated and more distinct on the wing.

A left valve of medium size has a length of 42 mm., height 25 mm., hinge-line about 40 mm.

Compared with *L. Clitus*, the body of the shell is more elongate-ovate or sub-spatulate, narrowing more rapidly toward the post-extremity; the wing is wider and sinuosity less deep, its greatest depth being near the cardinal line.

Formation and locality. In the Chemung group, Kelly's creek, Tioga county, Pa.

LEPTODESMA JASON.

Leptodesma Jason, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-triangular; body elongate-ovate or subspatulate, attenuate toward the anterior end, oblique at an angle of about 40° with the hinge-line; length once and a half the height; margin on the anterior gently curving into the undefined byssal sinus; thence nearly straight to within one-fourth the length of the valve from the posterior extremity, which is regularly and broadly rounded. Left valve regularly convex below, narrow and gibbous above. Right valve depressed-convex below, more convex above, and moderately gibbous in the umbonal region. Hinge-line straight, somewhat less than the greatest length of the body. Beaks sub-anterior, acute, directed forward, slightly elevated above the hinge-line. Umbonal region abruptly gibbous, subtending a very acute angle. Anterior end short. Wing joining the body near the posterior extremity; margin regularly concave, the greatest concavity near the middle of the width, terminating in a short spiniform extension. In the right valve the wing is proportionally larger and less defined.

Test thick, marked upon the body and wing with sharp, elevated, lamelliform striæ and intermediate finer striæ; on the anterior the striæ are fasciculate.

A large left valve has a length of 40 mm., height 26 mm., hinge-line 32 mm. A right valve has a length of 36 mm., height 20 mm., and hinge-line 34 mm.

This species resembles *L. Hector* in general form, but is broader at the posterior end, more abruptly gibbous along the axis above the middle, the wing joins the body nearer the posterior extremity, and the margin of the wing has the deepest concavity in the center of its width. The right valve is more convex than the right valve of *L. Hector*, and the concentric elevated striæ are much stronger. In all these characters it also differs more extremely from *L. extenuatum*.

Formation and locality. In compact sandstone of the Upper Chemung group, alternating with some red beds, on Seely creek, Tioga county, Pa.

LEPTODESMA PELOPS.

Leptodesma Pelops, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished*.

SHELL larger than the medium size, sub-rhomboidal; body ovate, oblique at an angle of about 40° with the hinge-line; height two-thirds the greatest length; ante-byssal and ventral margins very oblique and continuing in nearly a straight line for two-thirds the length, with a slight concavity for the byssal sinus; posterior margin very broadly curving. Left valve depressed-convex below, gradually becoming more convex above the middle, and somewhat gibbous on the umbo. Right valve unknown. Hinge-line straight, nearly equal to the greatest length of the shell. Beak sub-anterior, inclined forward, obtuse, scarcely elevated above the hinge-line. Umbonal angle acute. Anterior end triangular, prolonged, acute. Wing joining the body of the shell at the posterior extremity; margin symmetrically concave; extremity produced and acutely angular.

Test marked by distant, sub-equal, lamellose elevated striæ, with finer intermediate striæ. The stronger striæ are regular on the wing and posterior slope of the body, and become irregular and fasciculate on the anterior side and lower half. The hinge shows a narrow striated ligamental area, and, apparently, a slender lateral tooth.

A large left valve has a length of 44 mm., height 28 mm., and hinge-line 42 mm.

This form is more oblique, and the wing is longer and narrower than in *L. Orodes*.

Formation and locality. In the Upper Chemung group at Mansfield, Tioga county, Pa.

LEPTODESMA ORCUS.

Leptodesma Orcus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body ovate, straight on the posterior slope, oblique to the hinge-line at an angle of about 40°; length about one-third greater than the height; ante-byssal margin oblique, slightly impressed at the sinus, nearly straight along the base and regularly rounded posteriorly. Left valve symmetrically and gently convex below, slightly gibbous above. Right valve unknown. Hinge-line straight, length equal to three-fourths the length of the shell. Beak anterior, acute, little elevated above the hinge-line. Umbonal region narrowly gibbous, subtending a very acute angle. Anterior end short, limited by an oblique byssal depression; extremity acute. Wing of medium size, joining the body about three-fourths its length from the beak; margin abruptly curving forward from the base to near the hinge-line, where it is sharply recurved into a short, angular extension of the cardinal line.

Test thin, marked by fine concentric striæ, which are somewhat fasciculate on the body and anterior part of the shell, and a little more sharply elevated on the wing.

The specimen described has a length of 30 mm., height 22 mm., and hinge-line 24 mm.

The form and proportions of body are quite similar to *L. Lysander*, but it is wider on the posterior and narrower on the anterior; the body more oblique to the hinge; the striæ less sharply elevated, curving more forward along the posterior slope, and more abruptly recurved under the cardinal line.

Formation and locality. In the Chemung group at Kelly's creek, Tioga county, Pa.

LEPTODESMA LYSANDER.

Leptodesma Lysander, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 22. Jan., 1883.

SHELL of medium size, sub-rhomboidal; body ovate, abruptly narrowing toward the front, oblique to the hinge-line at an angle of about 45°; length one-third greater than the height; ante-byssal margin oblique above, curving into the marked sinus, regularly rounded along the base and posterior extremity. Left valve depressed-convex below, more convex above, and moderately gibbous on the umbo. Right valve unknown. Hinge-line straight, about equal to the greatest length of the valve. Beak sub-anterior, moderately prominent. Umbonal region but slightly gibbous, subtending an acute angle. Anterior end broad, obliquely truncate; extremity slightly extended and acute. Wing narrow-triangular, joining the body at the posterior extremity; margin concave, greatest concavity just above the middle, thence turning outward it is produced into a spiniform extension of the cardinal line.

Test marked by fine concentric striæ, with sharp lamellæ at nearly regular intervals over the body and wing, becoming crowded and fasciculate on the anterior of the shell.

A specimen has a length of 35 mm., height 24 mm., and hinge-line 33 mm.

This species differs from *L. Corydon* in its shorter and broader form; the body is less oblique and more abruptly narrowed toward the anterior; the striæ are less abruptly recurved along the posterior slope.

Formation and localities. In shales of the Chemung group at Kelly's creek and Mansfield, Tioga county, Pa.

LEPTODESMA NEREUS.

Leptodesma Nereus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body broadly ovate, narrowing rapidly to the anterior end, and oblique to the hinge-line at an angle of 45°; length less than one-third greater than the height; ante-byssal margin gently curved, extending into a wide sinus, broadly rounded along the base, curving regularly on the post-basal side and abruptly recurved in the upper part. Left valve gently convex below, more convex above, and moderately gibbous on the umbo. Right valve smaller, more depressed below, nearly equally convex toward the umbo. Hinge-line straight, less than the length of the valve. Beaks sub-anterior, acute, directed forward, rising slightly above the hinge-line. Umbonal region gibbous in the left valve, narrower but equally gibbous in the right valve. Umbonal angle acute. Anterior end small, abruptly curving into the byssal depression; extremity acute, not prolonged. Wing broad, extending along the body about four-fifths of its length from the beak; margin very oblique in the lower part and moderately concave above the center, then turning abruptly backward just below the cardinal line, and produced into a short spiniform extension. In the right valve the wing is less defined and less concave on the margin.

Test thin, marked by concentric striæ, which are fasciculate on the body and anterior part, and more elevated, distant and sharp upon the wing. Muscular impression large, sub-circular, situated on the posterior slope below the middle of the length. The pallial line extends from the lower part of the muscular impression nearly parallel to the anterior and basal margin. The hinge of the left valve has a strong groove extending its entire length; the right valve has an oblique posterior fold.

One specimen has a length of 35 mm., height 26 mm., hinge-line 31 mm. A similar example has a length of 34 mm., height 24 mm., and hinge-line 28 mm. A right valve has a greatest length of 31 mm., height 20 mm., and hinge-line 25 mm.

This species resembles *L. Orcus*, but the wing is wider, less deeply and abruptly sinuate, and the striæ turn more abruptly forward at the junction of the body and wing. The body is narrower and more oblique than in *L. Lysander*, and the anterior end less prolonged.

Formation and locality. In the shales of the Upper Chemung group near Canton, Bradford county, Pa.

LEPTODESMA ALATUM.

Leptodesma alatum, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, sub-rhomboidal; body ovate, rapidly narrowing toward the beak, oblique, making an angle of about 50° with the hinge-line; length one-third greater than the height; ante-byssal margin oblique and curving into the distinct sinus; ventral margin gently curved, joining the broad, rounded, posterior extremity. Left valve gently convex below, becoming more convex and slightly gibbous above the middle. Right valve depressed in the lower portion; in the middle and above about equally convex with the left. Hinge-line straight, a little less than the length of the valve, and greater than the height. Beak sub-anterior, directed forward, acute, but little elevated above the hinge-line in the left valve. Umbonal region narrow, and abruptly gibbous. In the right valve the beak is depressed, and the umbonal region a little less gibbous than in the other valve. Anterior end small, acute at the extremity, rounded below to the distinct byssal sinus. Wing large, wide-triangular, joining the body at the posterior extremity; margin moderately concave, the greatest concavity being above the middle, from which point it turns abruptly outward and the extremity is produced into a spiniform extension. In the right valve the wing is less distinctly limited from the body than in the left.

Test thin, marked by sharp, elevated, concentric striæ, with finer intermediate lines of growth. The stronger striæ are somewhat regular upon the body and wing, while on the anterior side they are crowded and fasciculate. Muscular impression large, sub-circular, situated below the middle of the posterior slope. The pallial line extends from the lower part of the muscular impression, parallel to the basal and anterior margins, into the cavity of the beak. Ligamental area wide.

A left valve of this species has a length of 35 mm., height 26 mm., and hinge-line 33 mm. A somewhat larger right valve has a length of 38 mm., height 28 mm., and hinge-line 33 mm.

Formation and locality. In the shales of the Chemung group at Canton, Bradford county, Pa.

LEPTODESMA ORUS.

Leptodesma Orus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-rhomboidal; body broadly ovate, abruptly contracted toward the anterior end, oblique at an angle of about 50° with the hinge-line; ante-byssal margin oblique, curving into the marked sinus, thence gently curving to the posterior extremity, which is broadly rounded. Left valve depressed-convex below, moderately convex above. Right valve unknown. Hinge-line straight; length about five-sixths the greatest length of the valve. Beak sub-anterior, directed forward, slightly rising above the cardinal line. Umbonal region moderately gibbous, subtending an acute angle. Anterior end triangular, abruptly acute at the extremity, defined by a marked byssal depression. Wing large, triangular, without distinct limitation, joining the body near the posterior extremity; margin oblique below, concave above the middle, turning abruptly outward and terminating in a sharply angular extension of the cardinal line.

Test thin, marked by sharp, elevated, concentric striæ with finer intermediate ones. The stronger striæ are regular on the wing and posterior side; irregular and fasciculate on the anterior.

Two left valves have respectively these dimensions: length 48 and 42 mm., height 32 and 30 mm., hinge-line 40 and 35 mm.

This species resembles *L. Pelops*, but the body is broader and less oblique, the anterior portion not so attenuate. the wing somewhat wider, the greatest sinuosity in the margin of the wing being nearer to the cardinal line, and the extremity of the wing more acuminate.

Formation and locality. In shales of the Chemung group, Mansfield, Tioga county, Pa.

LEPTODESMA ALIFORME.

Leptodesma aliforme, HALL. Pal. N.Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 28. Jan., 1883.

SHELL large (right valve), elongate, triangular; body narrow, spatulate, oblique at an angle of about 30° with the cardinal line; length twice the height; margin of shell oblique anteriorly, continued along the base in nearly a straight line for two-thirds its length, thence curving to the posterior extremity, which is abruptly rounded. Right valve nearly flat below, depressed-convex in the middle, slightly gibbous in the umbonal region. Left valve unknown. Hinge-line straight; length equal to the greatest length of the shell. Beak sub-anterior, depressed, directed forward. Anterior end narrow-triangular; extremity attenuate, very acute. Wing narrow, elongate, triangular, extending to the posterior extremity of the valve, not defined; margin concave, the greatest concavity below the middle; extremity slightly produced, angular.

Test not preserved. The specimen is a cast of the interior, showing some faint indications of concentric striæ. Muscular impression large, situated at about the middle of the length of the posterior slope. Pallial line continued parallel to the anterior side, with slight interruptions nearly to the beak. The hinge is furnished with a slender, oblique lateral tooth.

The specimen described is 60 mm. in length, with a height of 29 mm., and hinge-line 61 mm.

This species bears considerable resemblance to *L. extenuatum* in the characters of the right valve; but it is proportionally narrower, the posterior extremity more abruptly recurved and the hinge-line less extended behind. A single right valve is the only specimen at present known. It differs sufficiently from the other forms here described to be easily recognized.

Formation and locality. In a white sandstone of the middle portion of the Chemung group near Angelica, Alleghany county, N. Y.

LEPTODESMA RUDE.

Leptodesma rude, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, fig. 12. Jan., 1883.

SHELL large, sub-rhomboidal; body broadly ovate below, rapidly attenuating above, oblique to the hinge-line at an angle of about 50°; length less than one-third greater than the height; ante-byssal margin curving into the broad sinus; ventral and posterior margins broadly rounded. Left valve convex below, becoming narrow and gibbous above the middle. Right valve less convex. Hinge-line straight, less than the length of the valve. Beak sub-anterior, directed forward, acute, little elevated above the cardinal line. Umbonal region narrow and gibbous, subtending an acute angle. Anterior end large, limited by a vertical byssal depression; extremity acute. Wing of moderate size, joining the body at the posterior extremity; margin concave; termination acute.

Test thick, marked by concentric striæ, which have been fasciculate, leaving strong undulations upon the cast of the interior. These surface characters are subdued in the right valve.

A left valve has a length of 51 mm., height 37 mm., hinge-line about 42 mm.

Specimens of this species usually present a very rough and irregular aspect from the character of the shell, with its strongly lamellose structure and the coarse matrix in which it is usually found. In a crushed specimen retaining both valves, the right valve is almost equally convex with the left; the surface is less lamellose and presents only gentle undulations.

Formation and locality. In a coarse sandstone of the upper part of the Chemung group, on the road from Olean, N. Y., to Smethport, Pa.

LEPTODESMA BITON.

Leptodesma Biton, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, sub-rhomboidal; body elongate-ovate, making an angle of about 45° with the hinge-line; height nearly two-thirds of the length; ante-byssal margin oblique, slightly curving into a long, shallow sinus, which impresses the margin for more than half the length of the valve; basal and posterior margins broadly rounded. Left valve regularly and gently convex in the lower part, becoming more convex and gibbous above the middle. Right valve unknown. Hinge-line straight, greater than the height of the valve. Beak sub-anterior, directed forward, but little elevated above the hinge-line. Umbonal region abruptly gibbous, subtending an acute angle. Anterior end produced, narrow, acute at the extremity, limited by an oblique, shallow byssal depression. Wing large, joining the body at the posterior end, not distinctly separated; margin slightly oblique below, gently concave above the middle, and curving slightly outward just below the cardinal line.

Test thin; cast marked by fine concentric striæ of growth, which, at intervals, have been elevated into fascicles, which, on the external shell, were probably sharp lamellose striæ.

The specimen described has a length of 50 mm., height 31 mm., and hinge-line 35 mm.

This species resembles *L. Orodes*, and may be distinguished by the more extended and acute anterior extremity, and the larger wing which is distinctly concave on the margin and recurved just below the cardinal line. It differs from *L. Maclurii* in its more produced anterior extremity, and broader wing which is less abruptly recurved at the extremity.

Formation and locality. In a coarse sandstone of the Upper Chemung group, south of Smethport, McKean county, Pa.

LEPTODESMA LESLEYI.

Leptodesma Lesleyi, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, sub-rhomboidal; body narrow, elongate-ovate, making an angle of 30° with the cardinal line; length more than one-third greater than the height; ante-byssal margin oblique, nearly straight above, curving into the broad sinus; ventral margin broadly curved; posterior extremity abruptly rounded. Left valve convex below, narrowly gibbous in the middle and on the umbo. Right valve less convex, depressed below. Hinge-line straight, nearly equal to the greatest length of the shell. Beaks sub-anterior, directed forward, acute and arching over the hinge in the left valve, depressed in the right valve. Umbonal region of the left valve narrowly gibbous, and subtending a very acute angle. Anterior end large, limited by a broad, distinct, oblique byssal depression; extremity flattened and acuminate. Wing large, triangular, joining the body near the post-basal extremity, limited by the abrupt forward bending of the striæ; margin deeply concave; extremity produced and acute. The wing of the right valve is scarcely defined from the body and less deeply concave on the margin.

Test marked by fine, irregular, concentric striæ which are strongly fasciculate and lamellose on the ventral side and anterior end, and are shown on the wing as sharp, elevated, regular striæ. Some specimens preserve fine regular striæ on the body of the valve, but they are usually somewhat irregular and lamellose. In an exfoliated and macerated condition they show fine radiating lines which probably belong to the intimate structure of the shell. Ligamental area (as preserved in an imperfect right valve) 1.5 mm. wide, and marked by very fine, minutely undulating longitudinal striæ. The hinge also shows an obscure oblique lateral tooth.

A left valve, of medium size, has a greatest length of 56 mm., height 31 mm., and hinge-line about 51 mm.

This species somewhat resembles *L. aviforme*, but is distinguished by its more oblique form, and wider anterior end. Specimens are quite abundant in an argillo-calcareous sandstone of the Upper Chemung group, associated with *Spirifera Verneuili*.

Formation and locality. In the Upper Chemung group, Auburn township, Susquehanna county, Pa.

LEPTODESMA AVIFORME.

Leptodesma aviforme, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, sub-rhomboidal; body elongate-ovate, broad behind, and rapidly narrowing toward the beak, oblique at an angle of a little less than 45° to the hinge-line; height more than one-half the length; ante-byssal margin very oblique, continued in a straight line into the shallow sinus, thence curving to the posterior extremity, which is broadly rounded. Left valve gently convex below, very convex above, and moderately gibbous on the umbo. Right valve unknown. Hinge-line straight; length a little more than the greatest length of the valve. Beak sub-anterior, directed forward, acute, not rising much above the hinge. Umbonal angle acute. Anterior end narrow, elongate, very acute, limited by a shallow byssal depression. Wing large, joining the body near the base; margin broadly and symmetrically concave; extremity produced into a spiniform extension reaching beyond the posterior extent of the shell.

Test marked by fine concentric striæ which are regular on the posterior part of the body and the wing, and very crowded and fasciculate on the anterior.

A large left valve has a length of 60 mm., height 37 mm., hinge-line 62 mm. A slightly larger, imperfect specimen has been found, the body of which, near the posterior extremity, has a greatest width of from 25 to 28 mm., and measures from 12 to 14 mm. in the narrow part between the beak and the byssal sinus.

This species differs from *L. Pelops* in the longer and more erect body, more attenuate anterior extremity, more extended wing and deeper sinus in the margin.

Formation and localities. In the middle beds of the Chemung group at Charleston, and near Mansfield, Tioga county, Pa.

SECTION *d, patulata.*

LEPTODESMA FLACCIDUM.

Leptodesma flaccidum, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboid-ovate, spatulate below; body oblique at an angle of about 45° to the hinge-line; length about one-third greater than the height; ante-byssal margin subtruncate, oblique, a little concave below, curving into the broad ventral margin; posterior margin abruptly rounded and recurved. Left valve moderately convex in the middle, gibbous on the umbo, depressed-convex in the lower part. Right valve unknown. Hinge-line straight; length about equal to the height of the shell. Beak obtuse, directed forward, moderately prominent, situated anterior to the middle of the cardinal line. Umbonal region gibbous, subtending an acute angle. Anterior end comparatively large, produced into a nasute extension. Wing small, narrow-triangular, joining the body of the shell more than one-third the height above the base; margin gently concave; extremity acute.

Test thin, marked by fine regular striæ of growth, which are fasciculate on the umbo and lamellose at nearly equal intervals on the lower part of the shell. The hinge is marked by a single slender groove.

A left valve has a length of 40 mm., height 27 mm., hinge-line about 27 mm.

This species resembles *L. complanatum*, but differs in its greater proportional length, and the body is more depressed and extended below. It is characterized by the spatulate posterior extension, which is more extreme than in any other species here described.

Formation and locality. In the Chemung group, Lawrenceville, Tioga county, Pa.

LEPTODESMA PATULUM.

Leptodesma patulum, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, sub-rhomboidal; body oblique, elongate, sub-ovate; length slightly more than one-third greater than the height; ante-byssal margin oblique, gradually curving to the ventral margin which is nearly straight; posterior margin broadly curved. Valves moderately convex below, scarcely gibbous above, similar in form; the right valve being a little smaller and less convex than the left. Hinge-line straight, somewhat longer than the height of the shell. Beaks at about the anterior third of the hinge-line, directed forward, somewhat prominent. Umbonal region moderately gibbous, not strongly defined. Umbonal angle acute. Anterior end large, produced into a nasute extension. Wing large, joining the shell at the posterior extremity; margin scarcely concave, abruptly produced along the hinge-line.

Test marked by fine lines of growth which are irregularly fasciculate, sometimes appearing as equi-distant, sharply elevated lamellæ; crowded on the anterior; more regular over the wing and abruptly recurving just beneath the hinge. The hinge is marked by one or two narrow, parallel, longitudinal grooves.

A specimen of medium size has a length of 40 mm., height 26 mm., and hinge-line 28 mm. A similar right valve has a length of 36 mm., height 24 mm., and hinge-line 27 mm.

This species differs from *L. flaccidum* in its much larger wing, which is more extended along the body of the shell. It is less convex and the umbo less gibbous than in any of the preceding species.

Formation and locality. In the upper part of the Chemung group at Mansfield, Tioga county, Pa.

LEPTODESMA COMPLANATUM.

Leptodesma complanatum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 2. Jan., 1883.

SHELL of medium size, obliquely semi-elliptical; body sub-ovate, moderately oblique; length one-third greater than the height; ante-byssal margin sub-truncate, gradually curving into the broad ventral margin; posterior margin abruptly rounded. Left valve depressed-convex, a little gibbous on the umbo. Right valve unknown. Hinge-line straight; length less than the height of the shell. Beak acute, incurved, directed forward, moderately prominent. Umbonal region indistinctly defined anteriorly; the posterior side limited by the post-umbonal depression. Anterior end short; extremity angular. Wing undefined, joining the body one-third of the length from the posterior extremity; margin gently concave; extremity scarcely produced.

Test marked by fine, sharply elevated, concentric striæ, which are more crowded anteriorly, and very regular on the wing.

The specimen described, which is a separate left valve, has a length of 28 mm., height 20 mm., and hinge-line 18 mm.

Formation and locality. In the shales of the Chemung group at Philipsburg, N. Y.

SECTION *e, arcoidea.*

LEPTODESMA MACLURII.

Leptodesma Maclurii, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, figs. 8, 13. Jan., 1883.

SHELL large, rhomboidal; body elongate, sub-elliptical, oblique, making an angle of about 45° with the hinge-line; length more than one-third greater than the height; ante-byssal margin oblique, gently curving into a long, shallow, undefined sinus; ventral margin nearly straight, curving abruptly into the posterior margin, which is rounded and abruptly recurved. Left valve moderately convex in the lower part, becoming gibbous and sub-angular along the line of the axis to the beak. Right valve distinctly arcuate, less convex, narrowly gibbous in the umbonal region. Hinge-line straight; length about equal to the height of the valve. Beaks sub-anterior, directed forward, but little elevated above the hinge-line in the left valve, depressed in the right. Umbonal angle acute. Anterior end narrow-triangular, limited by an oblique depression which extends nearly one-third of the length of the valve to the byssal sinus. Wing large, undefined; margin very oblique in the lower part, slightly concave above, the greatest concavity being a little below the hinge-margin; extremity produced into an angular extension. The right valve shows less distinction between the body of the valve and the wing.

Test thin, marked by distant lamellose lines of growth with intermediate finer striæ. These lines are more regular upon the wing and very much crowded and fasciculate upon the anterior side of the body. Hinge, posterior to the beak, furnished with a slender lateral tooth.

A left valve of this species has a length of 55 mm., height 35 mm., hinge-line 37 mm., and the body, at the posterior end, having a width of 25 mm. A right valve has a length of 45 mm., height 30 mm., and hinge-line about 28 mm.

The specimens of this species observed are casts of the interior in coarse sandstone, or impressions of the exterior in the same rock. The species is distinguished by its straight ventral side and the nearly parallel direction of the sides of the body in the left valve.

Formation and localities. In a coarse sandstone of the Upper Chemung group, on the road from Olean, N. Y., to Smethport, Pa., and at Bradford, Pa.

LEPTODESMA ARCIFORME.

Leptodesma arciforme, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL large, narrow, sub-rhomboidal; body sub-cylindrical, oblique at an angle of about 30° to the hinge-line; length nearly one-half greater than the height; anterior margin oblique, merging into the broad, low curvature of the ventral margin; posterior margin abruptly rounded and curving into the undefined wing. Valves very convex, strongly gibbous, obtusely sub-angular along the middle; the greatest convexity distant from the beak one-third the height of the valve. The right valve is less gibbous, but otherwise similar to the left. Hinge-line straight; length about equal to the height of the shell. Beaks prominent, directed forward and arching over the hinge, situated at about the anterior third of the cardinal line. Umbonal region angularly gibbous above, abruptly defined along the posterior slope. Umbonal angle acute. Anterior end short, angular. Wing an undefined, narrow-triangular expansion; margin straight or a little concave; extremity very slightly produced.

Test moderately thick, marked by fine concentric striæ, which are fasciculate on the body of the shell, and crowded and lamellose over the anterior.

A large left valve has a length of 60 mm., height 36 mm., and hinge-line 37 mm.

This species is distingushed from *L. Lichas* by its larger and stronger form, being very gibbous along the entire length of the shell and with a proportionally smaller wing.

Formation and locality. In the upper part of the Chemung group at Mansfield, Tioga county, Pa.

LEPTODESMA PHAON.

Leptodesma Phaon, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size, narrow-rhomboidal; body sub-cylindrical, very oblique, making an angle with the hinge-line of less than 30°; length nearly twice the height; ante-byssal margin short, oblique, curving into the broad, almost straight ventral side; posterior margin abruptly but regularly rounded and continuous with the base of the wing. Left valve very convex, gibbous above. Right valve unknown. Hinge-line straight, somewhat longer than the height of the shell. Beak at the anterior third of the hinge-line, obtuse, moderately elevated, directed forward. Umbonal region gibbous, not well-defined anteriorly, abruptly depressed on the posterior. Umbonal angle acute. Anterior end short, acute at the extremity, defined by a slight bend in the striæ indicating the byssal sinus. Wing small, narrow-triangular, joining the body near the posterior end; margin straight, very oblique; extremity angular.

Test marked by strong concentric striæ, which at equal intervals are raised into sharp lamellæ, and are more crowded in front.

A left valve has a length of 47 mm., height 25 mm., and hinge-line 27 mm.

This species is remarkable for its extreme obliquity of body. In its general features it somewhat resembles *L. arciforme*, but differs in the less angular gibbosity of the body, larger wing, more extended anterior end, and in the surface markings.

Formation and locality. In the upper part of the Chemung group at Mansfield, Tioga county, Pa.

LEPTODESMA PROPINQUUM.

Leptodesma propinquum, HALL. Pal. N.Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboidal; body narrow, sub-cylindrical, very oblique, making an angle of about 30° with the hinge-line; length more than twice the height; anterior margin oblique; ventral margin nearly straight on the anterior half, and broadly curving over the lower half; posterior margin abruptly curved. Valves gibbous, nearly equal in size and convexity. Hinge-line straight, longer than the height of the valve. Beaks at about the anterior third of the hinge-line, directed forward, very prominent, arching over the cardinal line. Umbonal region gibbous, limited posteriorly by the vertical descent of that side, scarcely defined on the anterior. The umbo and post-cardinal slope are obtusely sub-angular for about two-thirds of the length of the body. Umbonal angle acute. Anterior end not defined (the byssal depression being obsolete); extremity acute. Wing small, narrow-triangular, joining the body near the posterior extremity, undefined; margin straight or slightly concave, very oblique; extremity slightly produced, angular.

Test marked by regular, even, concentric striæ, which, when well preserved, are elevated and lamellose, and are crowded and fasciculate on the anterior end of the shell.

A nearly entire left valve has a greatest length of 45 mm., height 20 mm., and hinge-line 26 mm. A similar right valve has a length of 37 mm., height 18 mm., and hinge-line 22 mm.

This species is very similar to *L. Lichas*, but differs in the greater convexity of body, undefined byssal depression, and narrower wing.

Formation and locality. In the middle portion of the Chemung group at Mansfield, Tioga county, Pa.

LEPTODESMA LICHAS.

Leptodesma Lichas, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 21, figs. 35–39. Jan., 1883.

SHELL of medium size, sub-rhomboidal; body sub-cylindrical, very oblique; length nearly twice the height; ante-byssal margin subtruncate, extending below to the broad, gently curving base; posterior margin abruptly recurved. Valves very convex above, gently convex toward the posterior extremity, making the body somewhat cylindrical. Right valve probably a little shorter than the left, as inferred from the separated valves. Hinge-line straight, less than the length of the shell. Beaks acute, situated at the anterior third of the hinge-line, directed forward, prominent, arching over the cardinal line. Umbo abruptly gibbous, subtending an acute angle. Anterior end large, acute and nasute at the extremity. The byssal sinus makes only a slight depression in the margin. Wing narrow-triangular, joining the body near the posterior extremity, not distinctly limited; margin straight and oblique below, recurving just beneath the hinge-line, and forming a short mucronate extension.

Test thin, marked by fine concentric striæ which are irregularly crowded into fascicles, producing an undulated aspect to the surface.

The striæ are sub-lamellose on the anterior side, and sometimes fasciculate on the wing. The fascicles on the body are often marked on their summits by sharp, regular lamellæ. The structure as seen in exfoliated specimens is radiated; but this does not appear to be an exterior character. The hinge is marked by a single narrow groove; beyond this the characters of the interior are unknown.

A large left valve has a length of 45 mm., height 25 mm., hinge-line 27 mm. A smaller specimen has a length of 28 mm., height 16 mm., hinge-line 17 mm. A right valve has a length of 26 mm., height 15 mm., and hinge-line 15 mm.

Formation and localities. In the Chemung group at Philipsburg, Alleghany county, N. Y., and in Sullivan township, Tioga county, Pa.

LEPTODESMA QUADRATUM.

Leptodesma quadratum, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished*

SHELL of medium size, rhomboidal or sub-quadrate; body ovate, making an angle of nearly 40° with the cardinal line; length one-third greater than the height; ante-byssal margin nearly vertical in front, rounding below into the shallow sinus, and extending nearly the whole height of the valve; ventral margin nearly straight; post-basal margin abruptly rounded and joining the wing without limitation. Left valve convex, gibbous on the umbo, and obscurely angular along the posterior slope. Right valve equally convex. Hinge-line straight, equal to three-fourths the length of the valve, and equal to the height. Beaks situated at the anterior third of the hinge, prominent and arching over the cardinal line. Umbonal region gibbous, subtending an acute angle. Anterior end convex, limited by a shallow, oblique, byssal depression which is nearly as long as the height of the valve; length one-half the height; extremity slightly produced. Wing triangular, scarcely defined, joining the body at the posterior extremity; margin oblique, straight or slightly convex; extremity obtuse-angular. An imperfect right valve presents about the same characters of wing.

Test marked by fine striæ of growth which are strongly fasciculate on the anterior end.

A left valve has a greatest length of 31 mm., height 20 mm., and hinge-line 21 mm.

This species is distinguished by its short, broad, sub-quadrate form. It has very much the aspect of MODIOMORPHA, but clearly belongs with *L. Phaon* and *L. Lichas*, which are among the extreme variations of the species of LEPTODESMA.

Formation and locality. In the Upper Chemung group, Lindley township. Steuben county, N. Y.

SECTION *f, mytiloidea.*

LEPTODESMA ACUTIROSTRUM.

Leptodesma acutirostrum, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, rhomboid-ovate; body narrowly ovate and rapidly attenuate toward the beak, oblique, making an angle of a little less than 45° with the hinge-line; length nearly one-third greater than the height; ante-byssal margin oblique, sloping into the shallow sinus; broadly rounded below, the curvature continued into the posterior extremity. Left valve depressed-convex in the lower part, moderately convex in the middle, and slightly gibbous above. Right valve unknown. Hinge-line straight, less than the height of the valve. Beak anterior, acute, directed forward, scarcely rising above the hinge-line. Umbonal region narrow and moderately gibbous, subtending a very acute angle. The byssal depression reaches the margin just below the beak, leaving a very small, acute, anterior extremity. Wing large, undefined, joining the body at the posterior end; margin oblique, essentially straight, not recurved at the cardinal extremity.

Test thin, leaving upon the cast the marks of the striæ of growth which are more or less fasciculate upon the body, and crowded and lamellose in front. Hinge furnished with a distinct posterior tooth. Interior unknown.

The specimen described has a length of 32 mm., height 24 mm., and hinge-line 22 mm.

This species somewhat resembles *L. Orodes*, but the beak is more nearly anterior, the anterior end much smaller and more acute, the byssal sinus not extending so low on the body of the valve, and the body of the shell more distinctly attenuate toward the beak. It is especially distinguished by its narrow slender beak and small anterior end.

Formation and locality. In a sandstone of the Upper Chemung group at Warren, Pa.

LEPTODESMA MYTILIFORMÉ.

Leptodesma mytiliforme, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, figs. 7, 11. Jan., 1883.

SHELL of medium size, elongate-ovate; body narrowly elliptical, becoming attenuate in front, oblique, making an angle of nearly 45° with the hinge-line; length more than one-third greater than the height; ante-byssal margin oblique, gently curving into a scarcely perceptible sinus, giving a straight or slightly concave margin extending for two-thirds the length of the valve; posterior margin abruptly rounded. Left valve regularly convex in the lower half, becoming contracted, gibbous and sub-angular above the middle. The right valve is smaller, the hinge-line proportionally longer, the base of the valve and the wing much more depressed, and the umbonal region narrow and more angular. Hinge-line straight, about equal to the height of the valve. Beaks sub-anterior, directed forward, acute, scarcely raised above the hinge-line. Umbonal region narrow and gibbous, subtending a very acute angle. Anterior end short, abruptly attenuate, acute, limited by a shallow byssal depression which extends for half the length of the valve. Wing large, not strongly limited, extending nearly to the posterior extremity of the body; margin very oblique, not concave, nor recurved below the cardinal line; extremity obtuse-angular.

Test thin, marked by concentric striæ which have left their impression upon the cast of the interior, showing them to have been regular upon the body and wing, and crowded into fascicles upon the anterior side. Ligamental area narrow and finely striated.

The largest specimen of the left valve observed has a length of 48 mm., height 25 mm., and hinge-line 22 mm. A smaller example has a length of 33 mm., height 22 mm., and hinge-line 20 mm. A large right valve has a length of 40 mm., height 25 mm., and hinge-line 27 mm.

This species differs from *L. Mentor* in its proportionally longer, narrower and sub-angular body, the smaller, less defined wing, the less distinct byssal sinus, and the smaller anterior end. The wing is often imperfect, giving the shell much the aspect of MYTILUS or MODIOLA. The axis of the shell in the left valve is apparently slightly curved, giving it a characteristic expression.

Formation and locality. In a coarse sandstone of the Upper Chemung group, on the road from Olean, N. Y., to Smethport, Pa.

PTERONITES, McCOY.

PTERONITES PROFUNDUS.

Pteronites profundus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, figs. 25–27. Jan., 1883.

SHELL large, longitudinally semi-ovate; body semi-elliptical, arcuate, oblique to the hinge-line at an angle of about 30°; length about twice the height; anterior margin very oblique, slightly concave beneath the beak and gradually curving into the broadly rounded basal margin; posterior margin obliquely truncate, slightly curving below. Left valve convex in the lower part, gibbous from the middle upwards. Right valve unknown. Hinge-line straight; length more than the greatest length of the shell. Beak sub-anterior, obtuse, rising but little above the hinge-line, and apparently not incurved. Umbonal region very gibbous, subtending an acute angle. Anterior end produced into an acute extension, which is limited by a very shallow byssal depression. Wing not defined, extending from the beak the entire length of the shell, and produced beyond the posterior extremity of the body; margin very slightly concave, extending at nearly right angles to the axis of the body.

Test of moderate thickness, marked by concentric striæ. The casts show distant, irregular, concentric undulations. Hinge with a single continuous groove. The pallial line extends parallel to the ventral margin, from a point anterior to the beak to below the middle of the length of the body.

A large left valve has a length of 78 mm., with a height of 38 mm., and hinge-line 90 mm. A smaller example has a length of 37 mm., height 23 mm., and hinge-line 40 mm.

All the specimens of this species are casts of the interior, with the single exception of an individual which preserves the test very imperfectly. The concentric undulations of the cast are often a conspicuous feature, and the umbonal slope is occasionally obtusely subangular. The wing follows the general contour and convexity of the valve.

Formation and localities. In the Upper Chemung group, associated with *Spirifera Verneuili* near Olean, Cattaraugus county; in the vicinity of East Randolph, and other places in Cattaraugus county, N. Y.

PTERONITES ROSTRATUS.

Pteronites rostratus, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 22, fig. 24. Jan., 1883.

SHELL of medium size, broadly semi-ovate; body oblique at an angle of about 45° to the hinge-line; length nearly twice the height; ante-byssal margin oblique, gently curving into the broadly rounded basal margin; posterior margin somewhat obliquely truncate. Left valve depressed-convex below, convex in the middle, and somewhat gibbous above. Right valve unknown. Hinge-line straight; length greater than the greatest length of the shell. Beak sub-anterior, sub-acute, prominent. Umbonal region moderately gibbous, subtending an acute angle. Anterior end nasute. Wing not defined, in direct continuation of the convexity of the body, extending to the posterior extremity; margin very slightly concave, oblique to the cardinal line, slightly produced at the extremity.

Test ornamented by fine, elevated, concentric striæ, which are continued over the body and wing without interruption, becoming crowded and somewhat fasciculate on the anterior side and on the nasute extension in front. The umbonal region shows a few concentric undulations, which are not continued to the middle of the length of the valve.

The specimen described has a length of 29 mm., height 16 mm., and hinge-line 31 mm.

This species is much smaller than *P. profundus*, less elongate and less gibbous in its proportions. The beak is apparently more elevated and angular, but the angularity of the umbonal region is not continued along the body as in the preceding form.

Formation and locality. In the shales of the Chemung group at Rockville, Alleghany county, N. Y.

PTERONITES INOPTATUS.

Pteronites inoptatus, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size, broadly semi-ovate; body ovate, oblique, making an angle of about 25° with the cardinal line; ventral and basal margins broadly rounded; post-basal extremity abruptly recurved. Left valve regularly convex, slightly gibbous above. Right valve unknown. Hinge-line straight, less than the greatest length of the shell. Beak sub-anterior, directed forward, prominent and incurved over the cardinal line. Umbonal angle acute. Anterior end short, nasute; extremity acute. Wing very narrow-triangular, scarcely defined, joining the body at the posterior extremity; margin oblique, in direct continuation with the posterior extremity and curving backward just beneath the cardinal line; extremity acute.

Test marked by concentric striæ of growth which are strongly fasciculate on the anterior end and ventral margin.

The left valve described has a length of 38 mm., height 21 mm., and hinge-line 33 mm.

This species is distinguished from the other forms of this genus by its narrow wing and shorter hinge-line. It has the characteristic aspect of PTERONITES, although approaching, in several particulars, to some species of LEPTODESMA.

Formation and locality. In the Chemung group, Mansfield, Tioga county, Pa.

PALÆOPINNA, HALL.

PALÆOPINNA FLABELLA.

Palæopinna flabella, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, fig. 18. Jan., 1883.

SHELL large, broadly semi-ovate, gaping at the anterior extremity; axis oblique to the hinge at an angle of about 30°; length nearly twice the height; anterior margin abruptly truncate; ventral margin very broadly curving; posterior margin oblique, sub-truncate. Left valve depressed-convex in the posterior and ventral portions, becoming more convex above and moderately gibbous in the umbonal region. Right valve unknown. Hinge-line straight, equaling the greatest length of the shell. Beak anterior, terminal, prominent, directed forward, scarcely rising above the cardinal line. Umbonal region subtending an acute angle. Anterior end abruptly truncate; margin excavate. Wing continuous with the body of the shell without limitation or interruption; margin directed backward, nearly straight, continuous with the post-basal margin of the body; extremity abruptly rounded.

Test thin, marked by regular concentric striæ of growth which are cancellated by fine sub-equal radii; in the cast the concentric and radiating striæ are of nearly equal strength. On the anterior end the radii are obscure or obsolete as preserved in the cast. Ligamental area narrow, marked by a single longitudinal groove and a slight oblique furrow extending backward from the beak a little more than one-third the length of the hinge.

The left valve described has a length along the hinge-line of 80 mm., height 40 mm.; measured along the axis of the body the length is about 70 mm., and the anterior truncation is 25 mm. long.

The specimen described is a cast of the interior, preserving the surface markings in a subdued condition. The anterior margin appears to have been slightly incurved and the truncation resembles that in some forms of SOLEN.

Formation and locality. In the Oriskany sandstone, Schoharie, N. Y.

PALÆOPINNA RECURVA.

Palæopinna recurva, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 25, fig. 19. Jan., 1883.

SHELL large, elongate semi-elliptical; axis making an angle with the hinge-line of from 20° to 25°; length greater than twice the height; basal margin very broadly curving; posterior margin rapidly rounding and recurving toward the beak. Left valve depressed-convex below, convex above and becoming gibbous toward the beak. Right valve unknown. Hinge-line straight, not extending as far as the posterior extremity. Anterior end unknown. Wing not defined; margin continuous with the post-basal margin and abruptly incurving at the extremity.

Test thin, marked by fine sub-equal striæ of growth, which become lamellose on the pallial margin; and by radii of unequal strength, which are sometimes strongly crenulated by the concentric striæ. Anterior to the middle of the shell the radii are obscure.

The specimen described is imperfect on the anterior end but preserves a length of 120 mm., and a height of 62 mm.

This species differs from the preceding in its larger size, broadly rounded posterior extremity, and the hinge not extending as far as the posterior margin; the body is also more oblique and less convex.

Formation and locality. In limestone of the Upper Helderberg group, Stafford, Genesee county, N. Y.

ECTENODESMA, HALL.

ECTENODESMA BIROSTRATUM.

Ectenodesma birostratum, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 23, figs. 27-30. Jan., 1883.

SHELL large; body ovate, oblique; height greater than the length; margin regularly curving from the base of the anterior wing to the post-basal margin, where it is somewhat abruptly recurved. Left valve regularly convex below, gibbous in the umbonal region, somewhat arcuate, the point of greatest convexity being about the middle of its length. Right valve concave below, depressed-convex in the middle, convex on the umbo. Hinge-line straight, much longer than the length of the shell, and, in extreme specimens, more than once and a half greater than the length of the shell. Beaks acute, anterior to the middle of the shell, inclined forward, and arching over the hinge-line. Umbonal region gibbous, limited on the anterior side by a shallow undefined sulcus, and on the posterior side by the abrupt depression of the body, subtending an acute angle. Anterior wing large, triangular; margin concave; extremity produced to an acuminate extension. Byssal sinus shallow and undefined. Posterior wing large, triangular, joining the body below the middle of its height; margin concave; extremity produced into an acute termination.

Test of left valve marked with regular and even radii which are rounded above, flattened and sometimes bifurcate below; similar but more acute radii continue over the posterior wing. In the right valve the rays are more numerous, finer and sharp, and are continued upon the posterior wing with a little less force than on the body of the shell; and very much subdued upon the anterior wing; entire surface marked by fine, even, concentric striæ of growth. The specimens show an oblique lateral tooth, with obscure indications of anterior teeth or folds. Ligamental area narrow, marked with fine parallel striæ.

A left valve has a length of 45 mm., height 50 mm., hinge-line, when entire, about 75 mm. A small right valve has a length of 34 mm., height 27 mm., hinge-line about 45 mm.

This species is distinguished by the great and nearly equal extent of the hinge-line on both sides of the beak; by the peculiar form of the body of the shell; and by its surface characters, which are unlike any yet observed.

Formation and localities. In the Chemung group at Franklin, Delaware county; and a right valve referred to this species is from a point four miles above Chenango Forks, Chenango county, N. Y.

BYSSOPTERIA, HALL.

BYSSOPTERIA RADIATA.

Byssopteria radiata, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 32, figs. 21, 22; pl. 80, fig. 11. Jan., 1883.

SHELL large, wide-triangular, alate posteriorly; body undefined; length about five-sevenths of the height; anterior margin vertically truncate the entire height of the shell; basal and posterior margins broadly rounded. Valves sub-equal, depressed-convex on the basal and post-basal sides, sub-angularly gibbous on the umbo and along the anterior side. Hinge-line straight, less than the length of the shell. Beaks anterior, acute, elevated, and directed forward. Anterior end sub-nasute.

Test marked by strong, sub-equal, rounded radii which are wider than the interspaces, often bifurcating below the middle of their length, and on the outer portion of the undefined wing they are fasciculate and finer. Entire surface marked by striæ of growth which become elevated into fascicles toward the margins.

A right valve has a length of 55 mm., and height 72 mm. A left valve measures 54 mm. in length, and 79 mm. in height.

This species is unlike any Pectinoid or Aviculoid form described in this volume, and has somewhat the aspect of several species of AMBONYCHIA from the lower rocks, although probably very distinct in its generic relations.

Formation and locality. In the Upper Chemung group at Mansfield, Tioga county, Pa.

MYTILARCA, HALL.

SUB-GENUS PLETHOMYTILUS, HALL.

MYTILARCA (PLETHOMYTILUS) KNAPPI.

Mytilarca (*Plethomytilus*) *Knappi*, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size; body ovate, obtuse, broad below; height nearly equal to the length; ventral margin rounded with a slight sinuosity at the byssal opening; dorsal margin broadly rounded. Right valve moderately convex below, somewhat more convex in the umbonal region. Left valve similar in general characters. Hinge-line less than the height of the shell. Beak obtuse.

Test thin below, thicker on the upper part and cardinal line. Surface marked by fine, regular, elevated striæ of growth. Ligamental area narrow, coarsely striated longitudinally.

A right valve has a length of 48 mm., and height 44 mm.

This species differs from *P. oviformis* in its proportionally greater height, less attenuate beak, lesser convexity and the coarsely striated ligamental area. The relations of this species are somewhat obscure, owing to the obscure limitation of the beak and the effects of maceration and compression. It is however clearly distinct from any of the forms here described.

Formation and locality. In the shales of the Hamilton group on the shores of Skaneateles lake, N. Y.

MYTILARCA PYRAMIDATA.

Mytilarca pyramidata, HALL. Pal. N. Y., vol. v, pt 1. Plates and Explanations: Pl. 80, figs 1-3. Jan., 1883.

SHELL of medium size; body sub-angularly ovate, pyramidal; length one-third greater than the height; ventral margin truncate and concave, curving abruptly into the basal margin; dorsal margin very gently curving to the beaks. Valves equal, convex, gibbous above, and sub-angular along the anterior umbonal slope. The ventral side is rectangularly incurved. Hinge-line short. Beaks acute, extremely elevated, directed slightly forward and curving over the cardinal line.

The test has not been preserved. The casts are nearly smooth, but showing lamellose striæ on the pallial margin.

A specimen of this species has a length 36 mm., height 23 mm., breadth 22 mm.

This form is shorter, more gibbous, more attenuate toward the beak, and less rounded on the posterior side than *M. Chemungensis.*

Formation and locality. In the Schoharie grit, Schoharie county, N. Y.

MYTILARCA UMBONATA.

Mytilarca umbonata, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 32, figs. 1–7. Jan., 1883.

SHELL small to medium size; body ovate, acute above; length more than one-third greater than the height; ventral margin truncate, inflated at the byssal opening; basal margin abruptly rounded. Valves equal, strongly convex in the lower part and narrowly gibbous in the umbonal region. Ventral umbonal slope obtusely angular, concave between this and the ventral margin. Dorsal side not alate. Hinge-line short. Beaks acute, elevated, nearly vertical, arching over the cardinal line.

Test thin, marked by fine concentric lines of growth which become crowded and lamellose toward the pallial margin.

A specimen has a length of 33 mm., height 18 mm., breadth 19 mm.

This species differs from *M. Chemungensis* in its shorter and more gibbous form; the beaks more elevated and erect.

Formation and localities. In the Middle Chemung group, Ithaca, N Y., and near Mansfield, Pa.

MYTILARCA CARINATA.

Mytilarca carinata, HALL. MS. 1877.
" " HALL. S. A. MILLER in Cat. Amer. Pal. Foss., p. 197. 1877.
" " HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 33, figs. 15–19. Jan., 1883.

SHELL of small or medium size, body obliquely sub-ovate; length nearly twice the height, except in young specimens; ventral margin nearly straight or slightly concave for more than three-quarters of the length of the shell, thence rounding abruptly into the basal margin, then more gently rounded into the gently curving dorsal margin. Valves equal, depressed-convex in the posterior part, becoming moderately convex in the middle and scarcely gibbous above. The ventral umbonal slope is angular, and the shell between it and the margin is concave. Hinge-line short, less than the height of the shell. Beaks anterior, prominent, acute, slightly curving forward.

Test thin, marked by very fine concentric striæ of growth, which are crowded on the anterior side and toward the base. Ligamental area of moderate width, finely striated longitudinally. Cardinal teeth small, diverging, situated under the extremity of the beak. Lateral teeth two, small, oblique, situated just below the posterior extremity of the hinge-line.

A specimen has a length of 30 mm., and height 18 mm. A more elongate form has a length of 43 mm., and height 20 mm. A small individual has a length of 23 mm. and height 15 mm.

This form differs from *M. Chemungensis* in its proportionally shorter form, the young shells have a sub-triangular aspect, the ventral umbonal slope is always angular, and the body is more distinctly arcuate.

Formation and localities. In the middle portion of the Chemung group, Tioga and Chemung counties, N. Y.

MYTILARCA REGULARIS.

Mytilarca regularis, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL above the medium size; body narrowly ovate; length less than twice the height; byssal area scarcely depressed; ventral margin for two-thirds the length nearly straight, thence curving into the posterior margin which is regularly rounded; dorsal margin gently curving to the extremity of the cardinal line. Left valve gently and regularly convex in the posterior half, convex above and scarcely gibbous on the umbo. Right valve unknown. Hinge-line straight, short, oblique. Beak nearly erect, acute and abruptly attenuate.

Test thin, marked by fine elevated concentric striæ which are crowded on the ventral and dorsal sides of the valve. Ligamental area narrow, longitudinally striated.

The specimen described has a length of 48 mm. and height 28 mm.

As compared with *M. Chemungensis* this species has a proportionally wider form; it is more nearly equilateral, the umbonal elevation is less abrupt and more nearly central. It is proportionally higher than *M. occidentalis* and less elevated along the umbonal slope.

Formation and locality. In a sandstone of the Chemung group, near Leon Centre, Cattaraugus county, N. Y.

MYTILARCA SIMPLEX.

Mytilarca (*Modiola*) *simplex*, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 33, figs. 19, 21 (20 in error). Jan., 1883.

SHELL of medium size; body elongate-ovate, with an acute apex; length nearly twice the height; byssal area depressed; margin below nearly straight for two-thirds the length; posterior margin abruptly rounded; dorsal margin gently curving to the hinge-line. Valves equal, moderately convex in the posterior part, and gibbous on the umbo. The line of greatest convexity is on the ventral side of the axis. Hinge-line short. Beaks sub-erect, acute, abruptly attenuate.

Test marked by fine, closely arranged, concentric striæ.

A specimen has a length of 41 mm., and height 25 mm.

This species is somewhat intermediate to *M. Chemungensis* and *M. regularis*, but is distinguished from the former by its shorter form, and from the latter by its greater convexity and more attenuate beak. This form and the succeeding were referred to MYTILOPS, but a careful comparison shows them to be related to the species here arranged under MYTILARCA.

Formation and locality. In the sandstones of the Chemung group, west of Smethport, Pa.

MYTILARCA GIBBOSA.

Mytilarca gibbosa, HALL. Pal. N. Y., vol. v, pt. 1. *Unpublished.*

SHELL of medium size; body ovate-arcuate, obliquely truncate along the hinge-line; length less than twice the height; ventral margin nearly straight for more than three-fourths the length, abruptly curving into the posterior margin, thence gently rounded to the extremity of the hinge-line. Left valve very convex; the greatest convexity above the middle. Umbonal region gibbous. Right valve unknown. Hinge-line oblique, nearly equal to the height of the shell. Beak small, appressed, arching toward the ventral side.

Test marked by fine concentric striæ, which, at irregular intervals, are crowded into fascicles, leaving varices upon the surface of the cast.

The specimen described has a length of 45 mm., and height 26 mm.

This species is proportionally longer, beak more acute, and much more gibbous than *M. lata*.

Formation and locality. In the Upper Chemung group, Napoli, Cattaraugus county, N. Y.

MYTILARCA LATA.

Mytilops (*Modiola*) *lata*, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 33, fig. 22. Jan., 1883.

SHELL large; body broadly sub-elliptical, abruptly narrowing toward the beak on the dorsal side; length one-third greater than the height; byssal area slightly inflated, thence nearly straight for almost three-fourths the length of the shell; posterior margin broadly rounded; dorsal margin gently curved for two-thirds of the length and then truncated in nearly a direct line to the beak. Right valve moderately convex in the posterior part, becoming broadly convex in the middle, and somewhat gibbous in the umbonal region. Left valve unknown. Hinge-line oblique; extent unknown. Beak elevated, erect, acute.

Test marked by rather coarse, elevated lines of growth.

The specimen described has a length of 60 mm. and height 40 mm.

This species somewhat resembles *M. regularis*, but the beak is more anterior, the body wider and more convex, and the truncation of the cardinal margin is much longer.

Formation and locality. In the Chemung group, Randolph, Cattaraugus county, N. Y.

GOSSELETTIA, BARROIS.

GOSSELETTIA RETUSA.

Gosselettia retusa, HALL. Pal. N. Y., vol. v, pt. 1. Plates and Explanations: Pl. 30, figs. 1, 2. Jan., 1883.

SHELL of medium size; body very oblique, rhomboid-ovate, sub-arcuate; length one-third greater than the height; ventral margin nearly straight for two-thirds of the length, inflated at the byssal opening and concave below, thence abruptly curving into the broad basal and dorsal margin. Valves equal, regularly convex in the posterior part and gibbous in the umbonal region; the point of greatest convexity is above the middle. The ventral umbonal slope is sub-angular. Ventral side flat. Hinge-line short. Beaks acute, prominent, directed a little forward and incurved.

Test of moderate thickness, marked by lamellose concentric lines of growth which at irregular distances are crowded into fascicles.

The specimen described has a length of 49 mm., height 32 mm., breadth 30 mm.

This species differs from *G. triquetra* in its proportionally longer form, less expanded posteriorly; hinge-line shorter and less oblique to the body of the shell; and the ventral umbonal slope is less angular along the length.

Formation and locality. In the Hamilton group, Eighteen-mile creek, Erie county, N. Y.

ABSTRACT OF THE CHARACTERS OF THE GENERA INCLUDED IN THIS REPORT.

For the sake of completeness and as a guide to the genera, it has seemed expedient to supplement the specific descriptions by a short notice of the generic characters with references to the accompanying plates. These plates are intended to represent the characteristic generic forms, and to convey in a measure some idea of the variety of forms embraced in each genus. In a primary sense, the plates are also designed as a key to the genera, and to facilitate the study of the principal characters of the monomuscular Devonian lamellibranchiata of the State of New York.

Classification.

Pectenidæ	Pernopecten.	inequivalve.
	Crenipecten.	
Avipectenidæ	Aviculopecten.	
	Lyriopecten.	
	Pterinopecten.	
Pteriniidæ	Pterinea.	
	s. g. Vertumnia.	
	Actinopteria.	
	Ptychopteria.	
Aviculidæ	Limoptera.	
	Glyptodesma.	
	Leiopteria.	
	Leptodesma.	
	Pteronites.	
	Palæopinna.	
	Ectenodesma.	
Ambonychiidæ	Byssopteria.	equivalve.
Mytilidæ	Mytilarca s. g. Plethomytilus.	
	Mytilarca.	
	Gosselettia.	
	Modiola s. g. Mytilops.	

Pernopecten, Winchell.* Shell like Pecten. Hinge with a central cartilage pit and a crenulated hinge-plate on each side below the hinge-margin. This and the following genus appear to be more nearly related to the genus Pecten than to Aviculopecten.

Examples — *Pernopecten limiformis.* Pl. i, figs. 1, 2.
Pernopecten Shumardanus. Pl. i, fig. 3.

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* See note, page 277

Crenipecten, Hall. Like Pecten or Aviculopecten in form. Hinge furnished with a series of small cartilage pits throughout its entire length.

EXAMPLES — *Crenipecten Winchelli.* Pl. i, figs. 4, 5.
Crenipecten Leon. Pl. i, fig. 6.
Crenipecten amplus. Pl. i, fig. 7.
Crenipecten crenulatus. Pl. i, figs. 8, 9.

Aviculopecten, McCoy, is emended to include those forms which have the hinge-line usually shorter than the transverse diameter, and both ears well-defined. Test ornamented with rays.

EXAMPLES — *Aviculopecten princeps.* Pl. ii, figs. 1–4.
Aviculopecten fasciculatus. Pl. ii, fig. 5.
Aviculopecten duplicatus. Pl. ii, fig. 6.
Aviculopecten rugœstriatus. Pl. ii, fig. 7.
Aviculopecten dolabriformis. Pl. ii, fig. 8.
Aviculopecten insignis. Pl. ii, fig. 9.
Aviculopecten bellus. Pl. ii, figs. 10, 11.

Lyriopecten, Hall. Differs from the preceding in the short hinge-line and very small anterior ear. Test usually ornamented with strong rays.

EXAMPLES — *Lyriopecten magnificus.* Pl. ii, fig. 12.
Lyriopecten interradiatus. Pl. ii, fig. 13.
Lyriopecten cymbalon. Pl. ii, fig. 14.

Pterinopecten, Hall. Hinge-line long. Ears not well-defined, being simple expansions or extensions of the upper lateral margins to the hinge-line. Test ornamented with rays.

EXAMPLES — *Pterinopecten undosus.* Pl. i, figs. 12, 13.
Pterinopecten vertumnus. Pl. i, figs. 14, 15.
Pterinopecten erectus. Pl. i, fig. 16.

Pterinea, Goldfuss. Shell inequivalve, inequilateral; posterior side alate; anterior end nasute or auriculate. Ligament internal; ligamental area longitudinally striated. Cardinal teeth two or more. Lateral teeth linear oblique. Posterior muscular impression large, situated on the post umbonal slope. Anterior muscular impression small, situated within the rostral cavity. Test ornamented with rays.

EXAMPLES — *Pterinea flabella.* Pl. iii, figs. 1–3.
Pterinea Chemungensis. Pl. iii, fig. 4.

S. g. Vertumnia, Hall. Differs from Pterinea in having the right valve convex, and the left flat or concave. Hinge area narrow.

EXAMPLE — *Pterinea (Vertumnia) reversa.* Page 294.

Actinopteria, Hall. Differs from Pterinea in the absence of a broad striated ligamental area and strong cardinal and lateral teeth. Right valve subconvex. Surface with fine rays.

EXAMPLES — *Actinopteria subdecussata.* Pl. iii, fig. 9.
Actinopteria Boydi. Pl. iii, figs. 10, 11.
Actinopteria eta. Pl. iii, figs. 12, 13.
Actinopteria muricata. Pl. iii, fig. 14.

Ptychopteria, Hall. Differs from Actinopteria in the nasute anterior extremity, and large straight wing marked by a strong longitudinal fold. Hinge-line narrow, linear; furnished with one or two linear oblique cardinal and lateral teeth. Surface with fine rays.

EXAMPLES — *Ptychopteria Beecheri.* Pl. iii, figs. 15, 16.
Ptychopteria Salamanca. Pl. iii, figs. 17, 18.
Ptychopteria Proto. Pl. iii, fig. 19.

Limoptera, Hall. Shell large, inequivalve, inequilateral, subquadrate, strongly alate on the posterior side, auriculate on the anterior end. Ligamental area large, common to both valves, wider in the left valve, longitudinally striate and extending to the cardinal extremities. The hinge has an oblique posterior tooth and several cardinal folds under the beak. Anterior muscular impression very small and deep, situated at the apex of the rostral cavity; posterior impression large. Pallial line simple, formed of a series of small deep pits. Inter-pallial area with numerous small pits for the attachment of umbonal muscles. Test radiated; radii becoming obsolete with age.

EXAMPLES — *Limoptera macroptera.* Pl. iii, figs. 5, 6.
Limoptera cancellata. Pl. iii, fig. 7.

Glyptodesma, Hall. Shell aviculoid, erect or moderately oblique; inequivalve. Ligament external. Ligamental area striated, continuous. Hinge with two strong lateral teeth, and numerous irregular transverse plications along the cardinal margin. In form the shells of this genus resemble Actinodesma; but they have not the prominent diverging teeth of that genus. Surface marked by concentric striæ.

EXAMPLE — *Glyptodesma erectum.* Pl. iv, figs. 1–8.

Leiopteria, Hall. Shell aviculoid, oblique, subrhomboidal. Anterior extremity auriculate; wing large, extremity produced. Test without proper rays. Ligament external. Ligamental area marked by fine parallel longitudinal striæ. Hinge with one or two oblique slender lateral teeth. The cavity of the beak is partially separated from the anterior end by a short partition or clavicle.

EXAMPLES — *Leiopteria Rafinesquii.* Pl. iv, figs. 9, 10.
Leiopteria Dekayi. Pl. iv, fig. 11.

Leptodesma, Hall. In its prevailing forms this genus is similar to Leiopteria, except that the anterior end is always nasute and acute instead of auriculate and rounded. Hinge narrow, furnished with a slender lateral tooth just posterior to the beak and nearly parallel to the hinge-line. Ligament external. Ligamental area narrow, extending the entire length of the hinge, marked by fine, sharp, longitudinal striæ. Test with concentric striæ.

EXAMPLES — *Leptodesma longispinum.* Pl. iv, fig. 12.
Leptodesma Hector. Pl. iv, figs. 13, 14.
Leptodesma flaccidum. Pl. iv, fig. 15.
Leptodesma propinquum. Pl. iv, fig. 16.

Pteronites, McCoy. This genus is restricted to those possessing the characters of the original types. Body very oblique. Hinge-line longer than the body of the shell. Wing and hinge extended posteriorly. Test marked by concentric striæ.

EXAMPLE — *Pteronites profundus.* Pl. iv, fig. 17.

Palæopinna, Hall. Shell, in outline, somewhat similar to Pinna, gaping in front. Test marked by fine radiating lines. Body more convex and test with finer rays than in the ordinary Pinna. Hinge-line simple.

EXAMPLE — *Palæopinna flabella.* Pl. v, fig. 14.

Ectenodesma, Hall. Resembles Glyptodesma in outline, except that the anterior wing is more produced and both wings more acute at their extremities. Test ornamented with rays.

EXAMPLE — *Ectenodesma birostratum.* Pl. iii, fig. 8; Pl. iv, fig. 18.

Byssopteria. Shell erect, equivalve. Alate posteriorly, truncate, and with a nasute projection in front. Surface radiated.

EXAMPLE — *Byssopteria radiata.* Pl. v, fig. 13.

Mytilarca, s. g. *Plethomytilus, Hall.* Equivalve, mytiloid, gibbous shells with a finely striated ligamental area. Posterior side subalate. Hinge-line transverse. Lateral teeth small, oblique; no cardinal teeth have been observed. Test with concentric striæ.

EXAMPLES — *Mytilarca (Plethomytilus) ponderosa.* Pl. v, figs. 1, 2.
Mytilarca (Plethomytilus) oviformis. Pl. v, fig. 4.

Mytilarca, Hall. Shell equivalve, inequilateral and mytiliform with terminal beaks and short hinge-line, which is bordered by a flattened, longitudinally striated, ligamental area of greater or less extent. Cardinal teeth small, situated beneath the beak. Posterior teeth small and oblique, situated at the post-cardinal extremity of the hinge. Test free from radii, with a single known exception.

EXAMPLES — *Mytilarca lata.* Pl. v, fig. 3.
Mytilarca Chemungensis. Pl. v, figs. 5, 6.
Mytilarca carinatu. Pl. v, figs. 7, 8.

Gosselettia, Barrois. Shell subtriangular, truncate on the anterior side, subalate on the posterior side. Ligamental area wide, longitudinally striate. Cardinal teeth strong, situated under the beak. Lateral teeth elongate. Surface marked by concentric striæ.

EXAMPLE — *Gosselettia triquetra.* Pl. v, figs. 9, 10.

Modiola, s. g. *Mytilops, Hall.* The fossils of this genus resemble Modiola and Lithodomus in external form, and may also be compared with the fossil genus Myoconcha. Hinge-line narrow, oblique, extending about one-half the length of the shell. Beaks terminal.

EXAMPLE — *Modiola (Mytilovs) præcedens.* Pl. v, figs. 11, 12.

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DESCRIPTIONS

OF

FOSSIL CORALS FROM THE NIAGARA AND UPPER HELDERBERG GROUPS.

The fossil corals of the museum collections have been accumulating for many years, but there has been little opportunity of giving special systematic attention to their study. In 1876 some forty plates of photographic illustrations of species occurring in the Upper Helderberg and Hamilton groups were published. In the meantime large collections have been made from these rocks, and in 1877 the writer purchased of Rev. H. Herzer, now of Berea, Ohio, an extensive collection made from the several formations of Ohio, Indiana, Kentucky, Tennessee, Canada West and New York. This collection is especially rich in corals, from the Falls of the Ohio and adjacent country, and the specimens have been prepared with great care and labor to show the structure. The organic body being in a silicified condition has permitted the use of acids for the removal of the matrix and the filling of the cells. In this manner, through the labor of Mr. Herzer, a very remarkable collection had been formed. Later on Dr. James Knapp and Henry Nettleroth Esq., of Louisville have contributed many specimens from the Falls of Ohio and the vicinity of Louisville which have increased the value and interest of the former collection.

Mr. C. D. Walcott, now of the United States Geological Survey, has made, for the State Museum, very extensive collections of corals from the Upper Helderberg limestone of Western New York and Canada West; and from Eastern New York, collections have been made by Dr. J. W. Hall and others. The writer has likewise employed Mr. John De Cew, of Cayuga, Ontario, in collecting the corals of that part of the country and he has purchased a collection of these fossils from Mr. Edmond De Cew, of the same place. These collections altogether, have furnished a considerable amount of new material for study and description.

Nearly all the species heretofore described by MM. Edwards and Haime, Mr. Billings, and Dr. Rominger have been recognized in these combined collections, but are not here indicated for want of space for a complete description of the species. The accompanying paper contains descriptions of the Cyathophylloid forms which have been recognized as new or not heretofore described.

My thanks are especially due to Mr. George B. Simpson, without whose efficient aid I could not, at the present time, have undertaken the preparation of this paper. He has already, during previous years, in connection with myself, made critical studies of the species during their examination for the selection of specimens for drawing, for the palæontology of New York. He is therefore familiar with these forms, especially of the Upper Helderberg group in all their varying aspects.

More than eighty plates of original drawings of corals, for the Palæontology of New York have been completed for more than two years past (some of these having been published in 1876), but the delay in the publication of that part of the Natural History of the State, renders it important to present through other channels, some evidence of work done. Unfortunately for that work and for the evidence of general progress in the work of the State Museum, we have had no publication (except a single separate paper*) since 1879.

The present (35th) report contains the scientific papers† communicated with the 33d and 34th Reports of the State Museum, except the Reports of the State Botanist.

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* The corals and Bryozoans of the Lower Helderberg Group.

† The paper on the Bryozoans of the Upper Helderberg and Hamilton Groups, communicated to the 33d Report of the State Museum having been published, in abstract, in the Transactions of the Albany Institute, is for the present, withdrawn from the Museum Report.

FOSSIL CORALS OF THE NIAGARA GROUP.

STREPTELASMA, HALL.

STREPTELASMA ? (ZAPHRENTIS ?) EXSTANS, *n. sp.*

Corallum simple, turbinate; diameter of the calix 20mm., depth 20 mm., sides regularly and abruptly sloping toward the center, where there is an elevation, having a diameter at the base of 7 mm. and a height of nearly 10 mm.; number of lamellæ 74, of nearly uniform size at the margin, alternating below ; on the anterior side is one lamella more developed than the others toward which a few of the adjacent lamellæ converge, on each side of, and adjoining this prominent lamella, are four small ones, and on the dextral and sinistral sides of the calix, at equal distances from the anterior ray, are four other small lamellæ.

Formation and locality. Niagara limestone, Milwaukee, Wisconsin.

STREPTELASMA ? (ZAPHRENTIS) ? LIMITARE, *n. sp.*

Corallum simple, turbinate, curved; diameter of the calix 25 mm., depth 20 mm., anterior side nearly vertical; fossette situated posteriorly, commencing at the center, not extending on the sides ; the extremities of the lamellæ coalesce, forming a well defined vertical wall to the fossette; number of lamellæ 70, of uniform size at the margin, alternating below, the principal ones extending to the margins of the fossette.

Formation and locality. Niagara Limestone, Racine, Wisconsin.

PTYCHOPHYLLUM, EDWARDS & HAIME.

PTYCHOPHYLLUM FLORIFORME, *n. sp.*

Corallum simple, turbinate; diameter of the calix 35 mm., depth 10 mm., for a distance of 8 mm. from the margin the sides are gently, then abruptly, sloping toward the center; a space at the bottom 7 mm. in diameter elevated and indented on one side by the fossette, which consists of a shallow pit not extending on the sides of the calix, its continuation in that direction being marked by a single more prominent lamella; number of lamellæ 62, flattened and of nearly uniform size near the margin, alternating below; a few of the larger lamellæ converge to the single ray in the line of the fossette, but the greater portion continue to the center, where they are twisted and elevated forming a false columella.

Formation and locality. Niagara limestone, Racine, Wisconsin.

PTYCHOPHYLLUM FULCRATUM, *n. sp.*

Corallum simple, broadly turbinate, usually straight; increasing by calicular gemmation, the buds proceeding from near the margin; exterior with concentric wrinkles and striæ; external costæ distinct. There are numerous slender exterior processes which served for attachment and support. The largest specimen observed has a height of 20 mm., diameter of the calix 50 mm.; for some distance from the margin the calix is flat or gently sloping, then abruptly descending, frequently nearly vertical; a convex space at the bottom from 8 to 12 mm. in diameter; number of lamellæ 60, of uniform size, extending to the center where they are twisted and elevated forming a false columella; near the margin they are broad and flattened, becoming thinner as they approach the center. In young individuals there is an obscure fossette which is obsolete in all the older ones observed.

Formation and locality. Niagara Group, Louisville, Kentucky.

CHONOPHYLLUM, EDWARDS AND HAIME.

CHONOPHYLLUM VADUM, *n. sp.*

Corallum simple, turbinate, straight or slighly curved, acute at the base, regularly expanding to the calix; exterior with numerous abrupt constrictions, and fine concentric striæ; external costæ very distinct; height 35 mm., diameter of the calix 20 mm., depth 10 mm., sides slightly concave; a flat space at the bottom 5 mm. in diameter; number of lamellæ 70, flat, and of nearly uniform size at the margin, becoming thinner and alternating in size below; the principal ones extending to the center, where they are twisted and very slightly elevated.

Formation and locality. Niagara Group, Louisville, Kentucky.

CHONOPHYLLUM CAPAX, *n. sp.*

Corallum simple, broadly turbinate, regularly expanding; exterior with numerous concentric wrinkles and striations. Externally there are numerous slender processes, quite evenly distributed, which served for attachment and support; when exfoliated the exterior has a somewhat compressed vesiculose appearance; corallum consisting of thin, superimposed laminæ; height 35 mm., diameter of the calix 60 mm. depth 12 mm.; for a distance of 20 mm. from the margin it is gently sloping, then nearly vertical; a convex space at the bottom 15 mm. in diameter; tabulæ thin; fossette small, deep, not extending on the side of the calix; number of lamellæ 160, alternating in size, the smaller ones rudimentary, not more than one sixth the thickness of the others; near the margin the larger ones are broad, angular, having a width of about 1.50 mm. becoming thinner as they approach the center where they are twisted and elevated, forming a false columella.

This species has nearly the same form as *P. fulcratum;* it has also similar processes for attachment, and might, on a cursory examination, be mistaken for that species, but it is much more distinctly composed of thin, invaginated laminæ; the lamellæ are decidedly alternating in size and there are well developed tabulæ.

Formation and locality. Niagara limestone, Louisville, Kentucky.

HALLIA, EDWARDS AND HAIME.

I have adopted the Genus HALLIA of Edwards and Haime after much hesitation and misgiving. Among the large collection of corals from the Falls of the Ohio, the locality of the typical form of the genus, I have not found a single specimen possessing the characters given in the figure 3, pl. VI, of Polypiers des Terrains Palæozoique, and have been inclined to regard it as a possible modification of AULACOPHYLLUM, of which there are several species from that locality. There are, however, among the collections of the Niagara Group several forms which cannot, with propriety, be referred to the AULACOPHYLLUM or STREPTELASMA, but which possess the characters attributed to HALLIA. These forms are therefore, for the present, placed under this generic term.

HALLIA SCITULA, *n. sp.*

Corallum simple, small, broadly turbinate or patellate, rapidly expanding, length of posterior side 5 mm., of the anterior side 8 mm.; calix shallow, campanulate, diameter 15 mm., a flat or slightly convex space at the bottom 5 mm. in diameter, with a small oval depression at the center; number of lamellæ 60, of nearly uniform size at the margin, alternating below; commencing at the center and continuing to the anterior margin is a single lamella more prominent than the others, and to which about one-half of them converge, the remainder continuing to the central depression.

Formation and locality. Niagara Group, Louisville, Kentucky.

HALLIA DIVISA, *n. sp.*

Corallum simple, turbinate, curved, acute at the base, regularly expanding to the calix; height 15 mm., diameter of the calix 10 mm., depth 5 mm., quite regularly concave; there are two lamellæ, commencing at the center and continuing to the anterior and posterior margins, which are much more prominent than the others, the one situated on the anterior portion being about twice the length of the other; number of lamellæ 50, alternating in size, the smaller ones scarcely more than rudimentary, a few more than one-half of the principal ones converging to the prominent lamella of the anterior side, the remainder toward the center and the prominent lamella of the posterior side.

Formation and locality. Niagara group, Louisville, Kentucky.

HALLIA DIVERGENS, *n. sp.*

Corallum simple, turbinate, curved; diameter of calix 20 mm., length of anterior side 22 mm., of posterior side 12 mm.; sides abruptly and regularly sloping to the center; number of lamellæ 60, alternating in size, the smaller ones being scarcely more than rudimentary; commencing at the center and continuing to the anterior margin is a single stronger lamella to which about one-half of the others converge, the remainder converging to the transverse lamellæ and the center of the calix.

Formation and locality. Niagara limestone, Racine, Wisconsin.

HALLIA PLUMA, *n. sp.*

Corallum simple, turbinate, diameter of the calix 20 mm., length of posterior side 8 mm., of anterior side 25 mm., sides regularly sloping; commencing at the center, and continuing about half way to the anterior margin, is a narrow, very shallow fossette, which is scarcely perceptible a short distance from the center and along the middle of which is a single lamellæ more conspicuous than the fossette; number of lamellæ about 90, alternating in size, the smaller ones being scarcely more than rudimentary; somewhat more than one-half of the larger lamellæ converge to the fossette and the median lamella, the remainder to the transverse lamellæ and the center of the calix. This species may be distinguished from *H. divergens* by the more unequal sides of the calix, the shallow fossette and the finer lamellæ.

Formation and locality. Niagara limestone, Racine, Wisconsin.

ANISOPHYLLUM, EDWARDS AND HAIME.

ANISOPHYLLUM UNILARGUM, *n. sp.*

Corallum simple, turbinate, slender, acute at the base, regularly expanding to the calix; height 30 mm., diameter of the calix 12 mm., depth 10 mm.; number of lamellæ 50, alternating in size, smaller ones rudimentary; commencing at the center and continuing to the anterior margin is an excessively developed lamella which is prominent at the center, becoming less so as it approaches the margin, and at nearly right angles to it are two narrow fossettes; the two lamellæ anterior to the fossettes are somewhat more prominent than the others.

Formation and locality. Niagara group, Louisville, Kentucky.

ANISOPHYLLUM TRIFURCATUM, *n. sp.*

Corallum simple, elongate, turbinate, slender, very gradually enlarging; exterior with numerous concentric wrinkles and striations; height 20 mm., diameter of the calix 8 mm., depth 5 mm., number of lamellæ 54, three of the lamellæ more prominent than the others, one of which is situated anteriorly, the other two laterally, the remainder alternate in size, the smaller ones extending but a short distance from the margin; some of the lamellæ converge to the three prominent ones, the others to the center of the calix. This species may be distinguished from *A. unilargum* by its somewhat more slender form, its thinner lamellæ and the absence of lateral fossettes. The prominent lamellæ are not excessively developed.

Formation and locality. Niagara group, Louisville, Kentucky.

ANISOPHYLLUM? BILAMELLATUM, *n. sp.*

Corallum simple, turbinate, curved, acute at the base, regularly expanding to the calix; exterior with frequent rounded annulations; external costæ distinct; height of corallum 35 mm., diameter of the calix 20 mm., length of anterior side 25 mm.; the bottom of the cup is 4 mm. from the posterior side; number of lamellæ 64. Commencing at the bottom of the calix, and extending to the dextral and sinistral margins, are two excessively developed lamellæ, the remainder alternate in size, the larger ones extending to the bottom of the calix.

Formation and locality. Niagara group, Louisville, Kentucky.

ZAPHRENTIS, RAFINESQUE.

ZAPHRENTIS RIGIDA, *n. sp.*

Corallum simple, turbinate, slightly curved, diameter of the calix 20 mm., depth 20 mm., sides abruptly descending; a space at the bottom 10 mm. in diameter convex; fossette situated anteriorly, narrow, deep, margins well defined, not extending on the side; number of lamellæ 70, of nearly uniform size at the margin, decidedly alternating below, the smaller ones extending to the convex space at the bottom, the others to the center, where they are twisted, not elevated. The calix of this species most nearly resembles that of *S? (Z?) limitare* but is proportionally deeper, the lamellæ are more decidedly alternating in size and are twisted at the center. The sides are more nearly equal.

Formation and locality. Niagara limestone, Racine, Wisconsin.

ZAPHRENTIS CRISTULATUM, *n. sp.*

Corallum simple, turbinate, curved; diameter of the calix 30 mm., depth 20 mm., sides parallel with the exterior of the corallum; a space at the bottom 15 mm. in diameter slightly convex; fossette consisting of a deep depression situated anteriorly, not extending on the side of the calix; number of lamellæ from 90 to 100, decidedly alternating in size, the smaller ones about one-fourth the thickness of the others, which fasciculate, coalesce and extend to the center, where they are elevated, forming an elongate crest about 6 mm. in height, in a line with the fossette.

Formation and locality. Niagara limestone, Racine, Wisconsin.

ZAPHRENTIS PRESSULA, *n. sp.*

Corallum simple, turbinate, curved, compressed; calix oval, length 50 mm., width 35 mm., depth 30 mm.; fossette dextral, narrow, deep, not extending on the side of the cup; a space at bottom of calix 30 mm. in length and 25 mm. in width slightly convex; number of lamellæ about 120, of nearly uniform size at the margin, decidedly alternating below; the principal lamellæ fasciculate and coalesce, a few extending to the center, where they appear as interrupted contorted ridges.

Formation and locality. Niagara limestone, St. Charles, Illinois.

ZAPHRENTIS LATISINUS, *n. sp.*

Corallum simple, broadly turbinate, acute at the base, regularly expanding to the calix; length of posterior side 20 mm., of anterior side 50 mm., calix broadly oval, length 45 mm., width 35 mm.; tabulæ broad, extending the entire diameter of the corallum; fossette commencing 8 mm. from the center and continuing to the anterior margin, deep and very conspicuous, width 10 mm.; a smooth, slightly depressed space, of the same width as the fossette, continues to the center; number of lamellæ 40, of uniform size, extending to the smooth space at the bottom of the calix.

Formation and locality. Niagara limestone, Drummond's Island.

ZAPHRENTIS SUBVESICULARE, *n. sp.*

Corallum simple, elongate, turbinate, tortuous, acute at the base, quite regularly expanding to the calix, exterior with concentric wrinkles and rounded annulations; when exfoliated the exterior has a somewhat vesicular appearance; height of corallum from 40 to 50 mm., diameter of the calix from 15 to 20 mm., depth 10 mm., a space at the bottom from 8 to 10 mm. in diameter flat, indented on the posterior margin by the fossette, which consists of a narrow, deep pit not extending on the side of the calix; number of lamellæ from 60 to 70, of nearly uniform size at the margin, decidedly alternating below, the principal ones extending to the center, where they are sometimes slightly twisted, often only faintly indicated on the tabulæ at the bottom of the calix.

Formation and locality. Niagara group, Charlestown, Indiana.

ZAPHRENTIS SUBVADA, *n. sp.*

Corallum simple, turbinate, curved; diameter of the calix 35 mm., depth 15 mm., a space at the bottom 15 mm. in diameter convex, in the center of which is an elongate elevation having a height of 4 mm.; tabulæ broad; number of lamellæ 84, decidedly alternating in size, the smaller ones being about one-fourth the thickness of the others which fasciculate and coalesce, a few of them extending to the center and apparently forming the crest-like elevation at the bottom of the calix.

Formation and locality. Niagara limestone, Racine, Wisconsin.

AMPLEXUS, SOWERBY.

AMPLEXUS UNIFORME, *n. sp.*

Corallum simple, diameter of the calix 15 mm., depth 15 mm., flat for a distance of 2 mm. from the margin, then vertical; tabulæ broad, the bottom flat and smooth; number of lamellæ 30, of uniform size, crenulated, extending to the flattened space at the bottom.

Formation and locality. Niagara limestone, Port Byron, Illinois.

AMPLEXUS JUNCTUM, *n. sp.*

Corallum simple, diameter of the calix 8 mm., depth 18 mm., sides vertical, number of lamellæ 26, of uniform size, their margins finely denticulated; between the lamellæ are transverse dissepiments, 12 in the space of 5 mm. This species is very similar to *A. uniforme*, but the depth is proportionally much greater and the lamellæ are more closely arranged.

Formation and locality. Niagara limestone, Port Byron, Illinois.

CYATHAXONIA, MICHELIN.

CYATHAXONIA COLUMELLATA, *n. sp.*

Corallum simple, turbinate, slightly curved; diameter of the calix 20 mm., depth 15 mm.; fossette inconspicuous or obsolete; a space at the bottom of the calix 10 mm. in diameter convex, in the center of which is a smooth elevated node about 5 mm. in height; number of lamellæ 70, decidedly alternating in size, the smaller ones extending to the convex space at the bottom of the cup, the others to the node at the center.

Formation and locality. Niagara limestone, Racine, Wisconsin.

CYATHAXONIA HERZERI, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, acute at the base, regularly expanding to the calix; height 45 mm., calix oblique, diameter 30 mm., length of anterior side 15 mm.; columella conical, 7 mm. in height; number of lamellæ about 100, alternating in size, the smaller ones about one-third the thickness of the others which continue to the columella.

Formation and locality. Niagara group, Louisville, Kentucky.

CYATHOPHYLLUM, GOLDFUSS.

CYATHOPHYLLUM INTERTRIUM, *n. sp.*

Corallum simple, broadly turbinate, base obtuse, regularly expanding to the calix; external costæ very distinct; exterior with frequent slender processes which served for attachment and support; height of corallum 15 mm., diameter of the base 7 mm., of the calix 18 mm., depth 5 mm., quite regularly concave; a space at the bottom flat or slightly curved; tabulæ broad, extending the entire diameter of the corallum. There are 30 quite prominent thin lamellæ, and between each two of these are three smaller lamellæ; the large ones extend to within from 3 to 5 mm. of the center, leaving a smooth space from 6 to 10 mm. in diameter.

Formation and locality. Niagara group, Louisville, Kentucky.

CYATHOPHYLLUM BULLULATUM, *n. sp.*

Corallum simple, turbinate, curved, acute at the base, regularly expanding to the calix; proportional height and diameter varying from 20 mm. in height and 25 mm. in diameter at the calix, to 35 mm. in height and 20 mm. in diameter; exterior with numerous concentric wrinkles and fine striations; depth of calix 10 mm., broadly campanulate, a space at the bottom of 5 mm. in diameter flat or convex; number of lamellæ 60, of nearly uniform thickness, alternating in length, the longer ones continuing to within 2 or 3 mm. of the center, leaving a smooth space of from 4 to 6 mm. in diameter. The inter-lamellar vesicles are very distinct, sometimes obscuring the lamellæ, the corallum closely resembling a *Cystiphyllum.*

Formation and locality. Niagara group, Perry county, Tennessee.

HELIOPHYLLUM, HALL.

HELIOPHYLLUM GEMMIFERUM, *n. sp.*

Corallum simple, turbinate, usually nearly straight; increasing by calicular gemmation, the buds proceeding from the flat, marginal portion of the calix, and usually turning outward at a short distance from the base; frequently 9 or 10 buds from a single corallum; exterior with numerous concentric wrinkles and striations, and frequent processes which served for attachment and support; the proportional height and diameter of this species is variable, some individuals having a height of 40 mm. and a diameter at the calix of 10 mm., and others having a height of 30 mm. and a diameter of 30 mm.; in a calix 20 mm. in diameter the sides, for a distance of 6 mm. from the margin, are flat or gently sloping, then abruptly sloping toward the center where there is an elevation of 5 mm. in diameter, and of nearly the same height; number of lamellæ 60, of nearly uniform size at the margin, thickened and gently rounded, becoming thinner and alternating below; on the sides the smaller ones coalesce with the others which continue to the center, where they are twisted and elevated.

Formation and locality. Niagara group, Louisville, Kentucky.

HELIOPHYLLUM PRAVUM, *n. sp.*

Corallum simple, elongate, turbinate, curved or tortuous, acute at the base, with frequent constrictions above, not regularly expanding to the calix; exterior with numerous, narrow, angular annulations; height of corallum 25 mm., diameter of the calix 10 mm., depth 5 mm., some individuals having a greater proportional diameter; calix campanulate, a flat space 5 mm. in diameter at the bottom; fossette dextral, moderately conspicuous at the bottom, becoming obsolete before reaching the margin; number of lamellæ 50, of uniform thickness, alternating in length, rounded at the margin, becoming very thin as they approach the center; the shorter lamellæ continue to the flattened space at the bottom of the calix, the others to within a short distance of the center, leaving a well-defined concave space of 2 mm. in length and 1 m. in width, in continuation of the fossette; denticulations thin, prominent, 11 in the space of 5 mm.

Formation and locality. Niagara group, Louisville, Kentucky.

HELIOPHYLLUM DENTILINEATUM, *n. sp.*

Corallum simple, elongate, turbinate or sub-cylindrical, with frequent constrictions, not regularly expanding to the calix; diameter of the calix 10 mm., depth 5 mm.; sides vertical, bottom slightly convex; tabulæ broad, extending nearly the entire diameter of the corallum; number of lamellæ 60, alternating in size, the smaller ones frequently indicated only by an intermediate row of nodes, several of the larger ones extend entirely across the tabula at the bottom of the calix; denticulations strong, those of the smaller lamellæ and on the bottom of the calix appearing as rows of minute nodes. This species will be easily recognized by its slender, frequently constricted form, the vertical sides of the calix and the nodose lamellæ extending across the bottom.

Formation and locality. Niagara group, Louisville, Kentucky.

HELIOPHYLLUM MITELLUM, *n. sp.*

Corallum simple, small, broadly turbinate, attenuate below, quite regularly expanding to the calix; height 10 mm., diameter of the calix 15 mm., depth 5 mm., quite regularly sloping to the center; at the bottom a small flat or concave, smooth space; fossette very obscure or obsolete; exterior with numerous concentric wrinkles, occasionally with sharp constrictions; external striæ very distinct; number of lamellæ 60, alternating in size, the smaller ones being about one-half the thickness of the others, which continue nearly to the center of the calix; denticulations narrow, prominent, appearing as slender spinules, 14 in the space of 5 mm.; on the sides of the lamellæ the striæ are rounded.

Formation and locality. Niagara group, Louisville, Kentucky.

HELIOPHYLLUM PUTEATUM, *n. sp.*

Corallum simple, small, turbinate, curved; exterior with sharp, thin annulations and numerous concentric striæ; acute at the base, quite regularly expanding to the calix; height 12 mm., diameter of the calix 10 mm., depth 5 mm., at the center is a depression of 3 mm. in depth and 3 mm. in diameter at the top, gradually growing narrower; number of lamellæ 70, alternating in size, the smaller ones a little less than one-half the thickness of the others, sometimes appearing only as a row of small nodes; the principal lamellæ extend to the center; denticulations prominent, 15 in the space of 5 mm.

Formation and locality. Niagara group, Louisville, Kentucky.

CYSTIPHYLLUM, LONSDALE.

CYSTIPHYLLUM GRANILINEATUM, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, acute at the base, regularly and quite rapidly expanding to the calix, exterior with concentric wrinkles and numerous fine but distinct concentric striæ, of which there are 35 in the space of 5 mm.; external striæ very distinct; there are frequent slender processes serving for attachment and support; when decorticated the cysts are conspicuous; height of corallum 25 mm., diameter of the calix 25 mm., depth 15 mm.; cysts prominent, varying from 1 to 2 mm. in diameter, covered by the rudimentary lamellæ which number 120, of uniform size, extending to within 2 mm. of the center, and very finely granulated. This species has a close general resemblance to some of the shorter forms of *C. niagarense*, but the lamellæ and denticulations are very much finer.

Formation and locality. Niagara group, Louisville, Kentucky.

CALCEOLA, LAMARCK.

CALCEOLA PUSILLA, *n. sp.*

Corallum simple, turbinate, more or less curved, anterior side flat; exterior with concentric wrinkles and fine but very distinct striæ; no longitudinal striæ visible; height 14 mm.; outline of calix nearly semielliptical, margin crenulated; length from 10 to 12 mm., width from 7 to 8 mm., sides quite regularly sloping to the center; cysts prominent, from 1 to 2 mm. in diameter. Commencing above the center and continuing to the anterior margin is a very prominent ridge, increasing in width as it approaches the margin. Compared with *C. Tennesseensis*, the specimens (14) are smaller; the proportional length is greater; the curvature is usually less; the lamellæ of the anterior portion of the calix are finer; the cysts of the posterior portion are much more prominent, and sometimes also covering the anterior side; the depression below the ridge of the anterior side, so conspicuous in that species, is obscure or entirely wanting in this one.

Formation and locality. Niagara limestone, Falls of the Ohio.

PETROSPONGIA.

CYATHOSPONGIA, *n. g.*

Body solid, turbinate, cyathiform; structure similar to *astylospongia.*

CYATHOSPONGIA EXCRESCENS.

Body turbinate, cyathiform, straight or slightly curved; epithecal covering smooth or obscurely striate and transversely wrinkled with numerous radiciform processes or elongate nodes; margins of the cup oblique, thickened, marked with strong striæ; cavity deep; internal structure distinctly radiating from the apex or axis to the exterior, with transverse fibers or spiculæ. Height, from 40 mm. to 45 mm.; diameter about 30 mm. Specimens of this fossil bear a close resemblance in external form and character to *Axophyllum radicatum*, Edwards and Haime.

Localities and formation. Niagara limestone, Falls of the Ohio, and Perry county, Tennessee.

CORALS OF THE UPPER HELDERBERG GROUP.

STREPTELASMA, Hall.

Streptelasma lamellatum, *n. sp.*

Corallum small, simple, turbinate, straight or slightly curved; eight 40 mm.; diameter of the calix 15 mm., depth 35 mm.; umber of lamellæ 60, alternating in size, near the center sharp, hickening as they approach the margin and becoming broadly angu-ar ; for a space of 10 mm. from the margin they are denticulated, he denticulations extending from one lamella to another, frequently ontinuous and having the appearance of concentric striations ; the arger lamellæ continue to the center, not twisted or elevated.

Formation and locality. Corniferous limestone, Canada West

Streptelasma tenue, *n. sp.*

Corallum small, turbinate or subcylindrical, regularly curved or ortuous ; surface with numerous annulations; longitudinal striæ very istinct; height about 35 mm. ; diameter of calix from 10 to 15 mm.; epth from 15 to 20 mm. ; number of lamellæ 50, alternating in ize, the larger ones extending nearly or quite to the center.

Formation and locality. Corniferous limestone, Falls of the Ohio.

Streptelasma dissimile, *n. sp.*

Corallum simple, turbinate, regularly curved ; exterior, near the ase, undulating, above with numerous sharp annulations of growth ; eight of corallum 30 mm. ; depth of calix 20 mm., sides abruptly escending; number of lamellæ 70, alternating in size, the smaller nes about one-half the size of the others and becoming obsolete on he sides; near the margin the lamellæ are broad and rounded, grow-g thinner as they approach the center, where there is sometimes a mooth space about 5 mm. in diameter, formed by the coalescing of e lamellæ, very oblique and nearly parallel with the anterior por-ion of the lamellæ.

This species is easily recognized by the prominent alternating rounded lamellæ at the margin, and the oblique smooth space at the bottom of the calix.

Formation and locality. Schoharie grit, Schoharie, N. Y.

STREPTELASMA INFLATUM, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, very attenuate below; exterior with gentle undulations and with strong longitudinal striae; height 40 mm.; for about one-half the height gradually, then very abruptly expanding: diameter of calix 40 mm., depth 25 mm.; fossette deep, commencing at the center, 5 mm. in width, 7 mm. in length, situated on posterior side: number of lamellæ 80, alternating in size, rounded at the margin, becoming sharp on the sides. The adjacent principal lamellæ of the anterior portion of the calix coalesce as they approach the center, the lamellæ thus formed again coalesce, forming fascicles of from 2 to 7 lamellæ; those of the anterior portion are not fasciculated. This species bears some resemblance to the figure of *Zaphrentis corticata*, but the lamellæ are coarser; their arrangement at the center is different, and the external characters are very different from those of that species.

Formation and locality. Corniferous limestone, Falls of the Ohio.

STREPTELASMA SIMPLEX, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, exterior with concentric wrinkles and striæ: longitudinal striæ distinct; height of corallum 30 mm., depth 20, sides regularly sloping; fossette situated a little on one side of the center, and consisting of a deep depression not extending on the sides of the calix: number of lamellæ 60, at the margin broad, rounded, of nearly uniform size, alternating below; the principal lamellæ extending to the center are twisted and elevated, forming a small false columella. In all the individuals observed there are no tabulæ.

One individual having a height of nearly 40 mm., and a diameter at the calix of 35 mm., is essentially the same as this species except that on one side of the calix is a smooth elevation extending from the center to the margin, being sharp at the center and widening as it recedes, having at the margin a width of 3 mm., but this feature is probably due to accident.

Formation and locality. Corniferous limestone, near Louisville, Ky.

STREPTELASMA LATERARIUM, *n. sp.*

Corallum simple, turbinate, curved; exterior with prominent rounded annulations; longitudinal striations fine, but very distinct; height of corallum 40 mm.; diameter of calix, 20 mm., depth 20 mm., sides abruptly descending, at the bottom a conical elevation, at the side of which is a fossette, which is a deep depression not defined on the side of the calyx; number of lamellæ 80, alternating in size, thickened at the margin, sharp below, the principal ones extending to the center, twisted and coalescing, forming a false columella.

Formation and locality. Corniferous limestone, Canada West.

STREPTELASMA AMPLIATUM, n. sp.

Corallum simple, turbinate, slightly curved; walls thin; acute at the base, regularly and rapidly expanding to the margin; length of posterior side 88 mm., of anterior side 55 mm., diameter of the calyx 50 mm., depth 40 mm., sides regularly sloping toward the center where there is a prominent rounded elevation 18 mm. in diameter; fossette situated at the sinistral margin of the elevation, consisting of a deep depression not extending to the side of the calyx; number of lamellæ 96, very slightly alternating in size at the margin thick, flattened, becoming thin, sharp and more decidedly alternating in size as they approach the center. The principal lamellæ continue to the center and are twisted and elevated, forming a false columella. This species may be distinguished from *Zaphrentis prolifica* by the more nearly uniform size of the lamellæ, its more rapidly expanding form and the different character of the bottom of the calyx; from *Z. gigantea* by the different form of the calyx, and from both forms by the absence of tabulæ.

Formation and locality. Corniferous limestone, Canada West.

STREPTELASMA PROFUNDUM, n. sp.

Corallum simple, turbinate, base acute, regularly expanding to the calyx; exterior with rounded annulations and undulations of growth; height 42 mm., diameter of the calyx 50 mm., depth 30 mm., sides sloping abruptly; fossette dorsal, inconspicuous; number of lamellæ from 80 to 90, alternating in size, the larger ones descending, coalescing and continuing to the center, very much thickened and widened, often turned laterally; sometimes coalescing at the center and having the appearance of tabulæ. This species may be easily recognized by the great prominence of the lamellæ at the center.

Formation and locality. Corniferous limestone, Falls of the Ohio.

STREPTELASMA FOSSULA, n. sp.

Corallum simple, turbinate, curved; exterior with prominent rounded ridges of growth; calyx oblique; length of posterior side of corallum 80 mm., of the anterior side 40 mm.; diameter of calyx 30 mm., depth of anterior side 22 mm.; fossette consisting of a deep depression just anterior to the center; number of lamellæ 72, alternating ones much stronger than the others, and continuing nearly to the center of the calix, which is smooth and concave. This species most nearly resembles *Zaphrentis prolifica*, but the center of the calix is depressed, while that of prolifica is always more or less convex, with distinct tabulæ.

Formation and locality. Corniferous limestone, Canada West.

STREPTELASMA CRATERIFORME, *n. sp.*

Corallum simple, turbinate, curved, acute at the base, regularly expanding to the calix; longitudinal striæ distinct, 12 in the space of 5 mm.; height of corallum 40 mm.; diameter of the calix 30 mm., depth 20 mm., walls very thin; fossette sinistral, commencing near the center and continuing to the margin, moderately conspicuous; number of lamellæ from 80 to 90, alternating in size, near the margin thickened and angular, very thin below. The principal lamellæ continue to the center, twisting and coalescing, but not elevated; the margins of the lamellæ are finely denticulated. The characteristics of this species are the deep calix and the thin walls.

Formation and locality. Corniferous limestone, Falls of the Ohio.

STREPTELASMA INVOLUTUM, *n. sp.*

Corallum simple, turbinate, exterior with undulations of growth and concentric striæ; longitudinal striæ distinct; height of corallum 40 mm.; diameter of calix from 15 to 20 mm., depth 20 mm., a space at the center 3 mm. in diameter depressed; fossette situated anteriorly; number of lamellæ from 50 to 60, alternating in size, the larger ones extending to the center, twisting, coalescing and depressed.

Formation and locality. Corniferous limestone, Falls of the Ohio.

STREPTELASMA AEQUIDISTANS, *n. sp.*

Corallum simple, turbinate, base acute, more or less regularly expanding to the calix, height 30 mm.; diameter of the calix 25 mm., depth 20 mm., sides abruptly and regularly sloping to the center; fossette commencing near the center and extending about half way to the margin, number of lamellæ from 90 to 100, alternating in size, at the margin, thickened and angular, becoming very thin and sharp as they approach the center. At equal distances from the fossette on each side there are two lamellæ continuing to the center; the adjacent lamellæ on one side converge to these; the remaining principal lamellæ continue to the center; on the sides of the lamellæ rectangular to the margins are very fine obscure striæ, and the margins are obscurely crenulated.

Formation and locality. Corniferous limestone, New York.

STREPTELASMA MAMMIFERUM, *n. sp.*

Corallum simple, turbinate, attenuate below, expanded on anterior side, flattened on posterior side; exterior with annulations and gentle undulations; longitudinal striæ, coarse, distinct; height 60 mm.; calix oval, length 45 mm., width 30, sides abruptly sloping, a conical elevation at the bottom 10 mm. in height; number of lamellæ 70, alternating in size (in some individuals this feature is much more prominent than in others), near the margin broad, rounded, becoming very thin as they approach the center, where they are twisted and coalescing, forming a prominent false columella, with prolonged tip. In some individuals where the internal structure can be seen there are no evidences of tabulæ, in others it would seem impossible that the prominent elevations are formed by the lamellæ alone, probably in the larger specimens tabulæ do exist.

Formation and locality. Corniferous limestone, Falls of the Ohio.

STREPTELASMA PAPILLATUM, *n. sp.*

Corallum simple, turbinate, curved; exterior with gentle undulations and a few sharp annulations; height of corallum 50 mm.; diameter of calix 35 mm., depth 25 mm., sides abruptly descending, leaving a flat or concave space at the bottom of the calix, 15 mm. in diameter, in the center of which is a conical elevation 5 mm. in height; number of lamellæ 80, at the margin of nearly uniform size, alternating below, the principal lamellæ extending to the center, twisted and elevated, forming a very much contorted false columella.

This species most closely resembled *S. mammiferum*, but is more abruptly expanding; the calix is circular, not oblique; the lamellæ are smaller, there are 8 or 9 in the space occupied by 6 in that species; the elevation on the bottom of the calix is not so prominent and is of a somewhat different character.

Formation and locality. Corniferous limestone, Falls of the Ohio.

STREPTELASMA COARCTATUM, *n. sp.*

Corallum simple, turbinate, curved, usually slightly compressed; exterior with broad undulations; height 50 mm.; calix slightly oval, greatest diameter 25 mm., depth 20 mm., sides regularly sloping to the center, an elevation at the bottom 5 mm. in height; fossette obscure or wanting; number of lamella 80, near the margin of uniform size, thickened and rounded, on the sides alternating, becoming thin as they approach the center, the principal ones continuing to the center twisting and coalescing. The elevation at the center might be considered as due to tabulæ but there is no evidence of their existence in the specimens examined.

Formation and locality. Corniferous limestone, Louisville, Ky.

PTYCHOPHYLLUM, EDWARDS AND HAIME.

PTYCHOPHYLLUM VERSIFORME, *n. sp.*

Corallum simple, turbinate, curved, sometimes tortuous, quite rapidly expanding; length usually from 40 to 60 mm.; diameter of calix from 40 to 70 mm.; exterior with frequent sharp annulations and concentric striæ; the calix for some distance from the margin is flat and then abruptly descending, having a depth of from 15 to 20 mm.; center of calix elevated; number of lamellæ from 90 to 100, slightly alternating in size, near the margin broad and nearly flat, becoming sharper as they approach the center; the stronger lamellæ continuing to the center, are twisted and elevated, forming a false columella.

Formation and locality, Corniferous limestone, Falls of the Ohio.

PTYCHOPHYLLUM STRIATUM, *n. sp.*

Corallum simple, broadly turbinate; height 35 mm.; diameter of calix 40 mm., depth 15 mm., broadly bell-shaped, an area at the bottom 15 mm. in diameter, nearly flat; number of lamellæ 74 of nearly uniform size at the margin, alternating below; the sides of the lamellæ have very prominent, interrupted, sharp striæ; the principal lamellæ continue to the center where for a space 10 mm. in diameter they are twisted and turned laterally, the striations of the lamellæ forming the most conspicuous feature.

Formation and locality. Corniferous limestone, Western New York.

AULACOPHYLLUM, EDWARDS AND HAIME.

AULACOPHYLLUM CONVERGENS, *n. sp.*

Corallum simple, broadly subturbinate, irregularly curved; exterior comparatively smooth, with concentric wrinkles and striations; longitudinal striæ, fine, distinct; individuals of the same height have a diameter at the calix varying from 25 to 45 mm.; height of one individual 10 mm., length of posterior side 12 mm., of anterior side 25 mm.; diameter of the calix 20 mm., for a space of 5 mm. from the margin flat, then the posterior portion nearly vertical, the anterior portion concave; fossette narrow, deep, extending from the bottom of the calix to the anterior margin; number of lamellæ varying from 80 to 120, according to the diameter of the calix, alternating in size, thin, denticulated; convergence of lamellæ to the fossette very distinct.

Formation and localities. Corniferous limestone, Falls of the Ohio and Clark Co., Ind.

AULACOPHYLLUM PRATERIFORME, *n. sp.*

Carallum simple, turbinate, curved; exterior with concentric wrinkles and striations, and occasional constrictions; height of corallum 30 mm., length of anterior side 50 mm., of posterior side 35 mm.; diameter of the calix 45 mm., depth 20 mm., quite regularly concave, bottom of the calix a little posterior to the center; fossette narrow extending from the center to the anterior margin; number of lamellæ 110, alternating in size, about 16 of the larger lamellæ converge to the fossette, the remainder continue to the bottom of the calix, where they are slightly twisted, not elevated. In general appearance this species is similar to *A. convergens,* but the anterior and posterior sides are more nearly equal in length, the deepest part of the calix is nearly central, while in that species it is posterior; the converging of the lamellæ to the fossette is much less distinct.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM PINNATUM, *n. sp.*

Corallum simple, turbinate, exterior with undulations of growth; longitudinal striations distinct; height 35 mm.; diameter of calix 30 mm., depth 25 mm., sides regularly sloping; a narrow deep fossette extends from the bottom to the anterior margin; number of lamellæ from 80 to 90, alternating in size, the larger ones only reaching the fossette and the bottom of the cup, near the margin, thickened, subangular, becoming thinner on the sides; convergence of the lamellæ to the fossette very distinct; there are two rudimentary lateral fossettes and a less conspicuous one on posterior side.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM PRINCEPS, *n. sp.*

Corallum simple, turbinate, regularly curved; exterior with numerous irregular undulations of growth, concentric wrinkles and striations; longitudinal striæ, fine and very distinct; height of adult individuals from 70 to 100 mm.; diameter of calix from 40 to 50 mm., depth 30 mm.; calix sometimes oval or subquadrangular, sides abruptly descending, leaving a broad flat, or elevated space, at the bottom; fossette commencing anteriorly to the center, not continuing to the margin; number of lamellæ from 160 to 180, at the margin of nearly uniform size, on the sides the alternate lamellæ are much larger than the others; about two-thirds of the lamellæ converge to the fossette or to a line in continuation of it, the remainder toward the center of the calix; near the center the lamellæ are thickened and twisted. From *A. sulcatum* it is easily distinguished by the greater number of and thinner lamellæ.

Formation and localities. Corniferous limestone, New York and Falls of the Ohio.

AULACOPHYLLUM CRUCIFORME, *n. sp.*

Corallum simple, turbinate, regularly curved, length of posterior side 25 mm., of anterior side 60 mm.; calix oblique, slightly oval, length 40 mm., width 35 mm., quite regularly concave; fossette commencing just posterior to the center and for the space of 10 mm. very deep and pyriform, narrowing and continuing to the anterior margin; number of lamellæ 140, at the margin of nearly uniform size, alternating below; the larger lamellæ, with the exception of those which converge to the fossette, continue to within 8 mm. of the center of the calix, leaving a convex space 16 mm. in diameter nearly smooth; at the junction of the posterior and anterior lamellæ are two rudimentary fossettes, at right angles to the principal one. This species is distinguished from *A. undulatum* by the conspicuous pyriform fossette, the smooth space at the bottom of the calix and the more conspicuous lateral fossettes.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM PRÆCIPTUM, *n. sp.*

Corallum simple, turbinate, straight or slightly curved; exterior with strong annulations, concentric wrinkles and fine striæ; longitudinal striæ fine, distinct; height of corallum 50 mm.; diameter of the calix 40 mm., depth 30 mm., sides regularly sloping to the center, the calix having the form of an inverted cone; principal fossette narrow, extending from the center nearly to the margin; number of lamellæ 120, of nearly uniform size at the margin, alternating below; There are two rudimentary fossettes, at right angles to the principal one; the lamellæ of the posterior side converge to the principal fossette, a few to the rudimentary fossettes, the remaining larger lamellæ continue to the center of the calix.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM REFLEXUM. *n. sp.*

Corallum simple, elongate, turbinate; exterior comparatively smooth; height 40 mm., diameter of the calix from 20 to 25 mm., depth 15 mm., sides nearly vertical; fossette conspicuous, extending from the center to the margin; number of lamellæ 80, alternating in size, the smaller ones being about one-third the thickness of the others and extending but a short distance from the margin; a portion of the larger lamellæ converge to the fossette, and their extremities on the side of the fossette are turned backward; the lamellæ opposite the fossette extend beyond the center to the bottom of the fossette; the remaining lamellæ do not reach the center of the calix, their extremities forming a line at right angles to the fossette. There are two rudimentary lateral fossettes.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM TRIPINNATUM, *n. sp.*

Corallum simple, turbinate, short, some individuals gradually, others rapidly expanding; diameter of calix 20 mm.; number of lamellæ 80, alternate ones much larger than the others; their arrangement is as follows, on the posterior side is one lamella extending from the margin to the bottom of the cup, a little to one side of the center, those adjacent it on the left side converge to it, those on the right side are parallel with it; on the right side is a deep fossette, on the left side a less conspicuous one, a sharp depression connecting the two; the lamellæ converging to the fossettes and connecting depression, not reaching the center of the calix; anterior to the depression is an oblique space 10 mm. wide and of about the same height, essentially smooth, formed by the coalescing of the lamellæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM TRISCULACTUM, *n. sp.*

Corallum turbinate, irregularly expanding, exterior with numerous constrictions caused by intermittment growth; internal costæ sharp, prominent; height of corallum 40 mm.; calix 35 mm. in diameter, subquadrangular in outline,depth 20 mm., sides abruptly sloping to the center. There are three fossettes,one wide and deep extending from the center of the calix to the anterior margin, the others, not so strong, but still conspicuous, are situated at right angles to the principal one; lamellæ about 112, alternate ones much larger than the others, very sharp and prominent, converging to the fossettes, and on the posterior side to a line in continuation of the principal fossette; a few reach the center of the calix and are there twisted and elevated forming a false columella.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM POCULUM, *n. sp.*

Corallum simple, subcylindrical, short, attached portion of the base large, frequently equal to the diameter of the corallum; height of corallum 20 mm.; diameter of calix 20 mm., depth from 8 to 12 mm., sides sloping abruptly, leaving at the bottom a concave space 3 mm. wide; fossette situated posteriorly, extending from concave space at the bottom of the calix to the margin; number of lamellæ from 80 to 90, alternating in size, the smaller ones scarcely more than rudimentary. The lamellæ near the fossette converge to it, the others to the center, a few extending upon the concave tabula and coalescing with it.

Formation and locality. Corniferous limestone, Falls of the Ohio.

AULACOPHYLLUM BILATERALE, *n. sp.*

Corallum simple, turbinate, subquadrilateral, straight or slightly curved, the attached portion usually broad, sometimes equal to the diameter of the calix ; height 50 mm.; diameter of the calix 30 mm., depth 20 mm. There are two fossettes, one slightly more conspicuous than the other, a depression continuing through the bottom of the calix connecting the two, and forming a continuous depression from one margin to the other; number of lamellæ from 100 to 120, alternating in size; near the bottom of the cup twisted and frequently coalescing.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS, RAFINESQUE.

ZAPHRENTIS INEQUALIS, *n. sp.*

Corallum simple, turbinate, acute at the base, regularly expanding to the margin ; exterior comparatively smooth : height 20 mm.; diameter of the calix 20 mm., depth 20 mm., sides quite regularly sloping to the center, a space at the bottom 8 mm. in diameter, flat or slightly convex ; fossette commencing posterior to the center and continuing to the anterior margin, at first an oval depression 4 mm. in length and two in width, abruptly narrowing and becoming deep, dying out as it approaches the margin ; number of lamellæ 60, alternating in size, the smaller ones about one-third the thickness of the others; near the margin thickened, angular, becoming thin on the sides ; the principal lamellæ extend to the margin of the fossette at the center.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS COMPLANATA, *n. sp.*

Corallum simple, compressed, turbinate, rapidly expanding; calix oval, oblique ; height of corallum 80 mm.; greatest diameter of calix 60 mm., depth on anterior side 50 mm., a space at the bottom 20 mm. in diameter, elevated, conical ; tabulæ large, numerous, at the center conical, the outward portion quite abruptly turning downward ; lamellæ at the margin 6 in the space of 10 mm., alternating in size, broadly rounded, becoming thin as they approach the center, the principal ones continuing to the center, thickened, twisted and coalescing with the tabulæ, forming a false columella. This species most closely resembles *Streptelasma mammiferum*, but may be distinguished from that species by its conspicuous tabulæ, the different character of the bottom of the calix, and its, proportionally, much greater depth.

Formation and locality. Corniferous limestone, near Leroy, New York.

ZAPHRENTIS CYATHIFORMIS, *n. sp.*

Corallum simple, turbinate, straight or curved, exterior with gentle undulations, comparatively smooth; longitudinal striations distinct; height of corallum 50 mm., base attenuate; diameter of calix 25 mm., depth 20 mm., sides abruptly descending, a space at the bottom flat, 15 mm. in diameter; fossette extending from flat space to sinistral margin; number of lamellæ 80, alternating in size, near the margin thickened, becoming sharp on the sides.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS PONDEROSA, *n. sp.*

Corallum simple, turbinate, curved and oblique, exterior with strong rounded ridges, longitudinal striations obscure; height of corallum 100 mm.; diameter of calix 45 mm., depth 35 mm., with a rounded elevation of 15 mm. in diameter at the bottom; number of lamellæ 90, of nearly uniform size, thickened and rounded at the margin, alternating below and becoming thin and sharp as they approach the center. A portion of the lamella extend to the center, twisting and coalescing with the elevated portion of the tabulæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS TABULATA, *n. sp.*

Corallum simple, cylindrical, elongate, in a fragment 17 centimetres long there is no increase in the diameter; exterior with abruptly rounded annulations situated at quite regular distances apart, 9 or 10 in the space of five mm.; tabulæ numerous, strong, extending nearly to the epitheca, central portion depressed, margins bending downward; diameter of calix 30 mm., a space at the center 10 mm. in diameter depressed, smooth; number of lamellæ from 80 to 90, the larger ones extending to the smooth space at the center. This species is easily distinguished by its elongated cylindrical form and its regularly annulated exterior, which closely resembles an Orthoceras.

Formation and locality. Corniferous limestone, Falkirk, Erie Co., N. Y.

ZAPHRENTIS CORRUGATA, *n. sp.*

Corallum simple, turbinate, curved; exterior with numerous angular ridges of growth; longitudinal striæ fine, very prominent, on the ridges frequently appearing as nodes; height of corallum 40 mm.; diameter of calix 20 mm., depth 15 mm., sides nearly vertical, leaving a flat space at the bottom 12 mm. in diameter; number of lamellæ 70, alternating in size, the smaller ones about one-third the thickness of the others, which extend on the flat space at the bottom, coalescing with the tabulæ and becoming obsolete, leaving a space at the center 5 mm. in diameter, which is smooth, or with the striæ very faintly indicated; fossette distinct extending from flat space at the bottom of calix to the exterior margin.

Formation and locality. Schoharie grit, Albany county, N. Y.

ZAPHRENTIS SUBCOMPRESSA, *n. sp.*

Corallum simple, turbinate, curved, somewhat flattened; exterior with numerous sharp annulations of growth; height of corallum 40 mm.; calix 30 mm. in diameter, broadly oval, depth 15 mm., sides abruptly descending, a slightly convex space at the bottom 15 mm. in diameter; fossette commencing a short distance from the center, and extending about half-way to the anterior margin; lamellæ about 60 of nearly uniform size at the margin; thickened and subangular on the sides, becoming thinner and alternating in size below; the principal lamellae extend to within 4 mm. of the center, for the last 3 mm. becoming thickened; the central portion of the cup consists of a smooth flat space 8 mm. in diameter. This species somewhat resembles *Z. corrugata,* but the lamellæ are much thicker at the margin of the cup, and of more nearly uniform size; the central portion of the calix is smooth and the lamellæ are much thickened as they approach this area.

Formation and locality. Corniferous limestone. Falls of the Ohio.

ZAPHRENTIS COLLETTI, *n. sp.*

Corallum simple, turbinate, curved, near the base and for some distance above usually compressed; calix circular; exterior with strong rounded ridges of growth, longitudinal striæ prominent; length of the posterior side of an adult specimen 40 mm., of the anterior side 70 mm.; diameter of the calix, 45 mm., sides gradually sloping, a space at the bottom, 10 mm. in diameter, very slightly elevated, smooth, or rugose from the contorted lamellæ; number of lamellæ from 70 to 80, of nearly uniform size at the margin, alternating below, the principal ones extending to the elevated space at the bottom. In different individuals there is considerable variation in the appearance of the lamellæ, in several the smaller lamellæ coalesce with the larger, forming lamellæ with thick rounded margins which continue in that condition to the bottom of the calix. In others they are of nearly uniform size at the margin, alternate ones becoming obsolete on the sides, leaving the principal lamellæ sharp. In others, on the posterior side, all the lamellæ extend to the flattened space at the bottom of the calix, that side having a much finer appearance than the other.

Formation and locality. Corniferous limestone. Crab Orchard, Kentucky.

ZAPHRENTIS PLANIMA, *n. sp.*

Corallum simple, turbinate, straight; exterior with undulations of growth; height of corallum 60 mm.; diameter of calix 30 mm., depth 15 mm., sides nearly vertical, a space at the bottom 15 mm. in diameter, flat and smooth; the fossette consists of a deep depression at the anterior margin of the flat space; number of lamellæ from 85 to 90, of nearly uniform thickness, alternating in length, the principal ones faintly indicated on the outer portion of the flat space, sometimes continuing to the center. In one individual the bottom of the cup is marked by a ridge in continuation of the fossette.

Formation and locality. Corniferous limestone. Falls of the Ohio.

ZAPHRENTIS FUSIFORMIS, *n. sp.*

Corallum simple, turbinate, very slightly curved, a little compressed, upper portion generally constricted; exterior with slight undulations of growth; height 20 mm., diameter at 10 mm. from the base 12 mm.; diameter of the calix 8 mm., depth 5 mm., at the bottom a slightly concave space 3 mm. in diameter; fossette narrow, conspicuous, commencing a short distance from the center and continuing to the anterior margin; number of lamellæ 60, alternating in size, the smaller ones scarcely more than rudimentary, the principal ones extending to the concave space at the bottom of the calix and abruptly ending. This species is easily recognized by its small size, constricted calix and peculiar appearance of the center.

Formation and locality. Corniferous limestone. Near Louisville, Kentucky.

ZAPHRENTIS OVALIS, *n. sp.*

Corallum simple, turbinate, straight or curved, slightly compressed; exterior with numerous constrictions caused by intermittent growth; height 50 mm.; diameter of calix 25 mm,, depth 10 mm., sides nearly vertical, a flat space at the bottom 15 mm. in diameter; fossette consisting of a deep depression at the dextral margin of the flattened area at the bottom of the calix; number of lamellæ 75, of uniform size, extending a short distance upon and coalescing with the tabulæ, becoming obsolete and leaving a nearly flat smooth space 13 mm. in diameter. It is possible, though not observed in the individuals examined, that at the margin of the cup there are small rudimentary lamellæ, in that case the number of lamellæ would be double that given above.

Formation and locality. Corniferous limestone. Falls of the Ohio.

ZAPHRENTIS SPISSA, *n. sp.*

Corallum simple, abruptly turbinate, straight or slightly curved, height of corallum 70 mm.; diameter of calix 50 mm., sides quite regularly concave; number of lamellæ 110, of uniform thickness, alternating in length, the principal ones extending to the center, fasciculating, coalescing and twisting, presenting a very irregular appearance; fossette conspicuous, commencing a short distance from the center and extending to the anterior margin.

Formation and locality. Corniferous limestone. Falls of the Ohio.

ZAPHRENTIS TORTA, *n. sp.*

Corallum simple, elongate turbinate, straight or slightly curved; exterior with concentric wrinkles and striæ, and occasional sharp annulations; longitudinal striæ distinct; height of corallum 60 mm.; diameter of calix 30 mm., depth 25 mm., sides abrupt. The tabulæ for a space of 5 mm. are nearly flat, then elevated about 5 mm., continuing for a short distance and then curving downwards; number of lamellæ 75, alternating in size, the smaller ones being about one-half the thickness of the others; the principal ones extend to the center of the tabulæ, fasiculating and very much twisted; the sides of the lamellæ have moderately strong longitudinal striations; fossette extending from the center of the calix to the margin, position variable.

Formation and locality. Corniferous limestone. Falls of the Ohio.

ZAPHRENTIS FASTIGATA, *n. sp.*

Corallum simple, turbinate, attenuate below, straight or slightly curved, usually compressed; longitudinal striæ distinct; height 60 mm.; calix oblique, diameter 25 mm.; fossette sinistral, extending from near the center about half way to the margin; number of lamellæ 75, alternating in size, the smaller ones being not more than one-sixth the thickness of the others; the principal lamellæ extend to the center of the calix coalescing, fasciculating and twisting. This species may be distinguished by its slightly compressed, nearly straight form and great difference in the size of alternate lamellæ.

Formation and locality. Corniferous limestone, New York.

ZAPHRENTIS TRISUTURA, *n. sp.*

Corallum simple, turbinate, quadrilateral, straight or slighly curved; longitudinal striæ conspicuous; height 50 mm.; diameter of calix 35 mm., sides nearly vertical or slightly convex, space at the bottom 25 mm. in diameter; fossette consisting of a deep depression at the sinistral margin of the tabulæ; number of lamellæ 70, alternating in size, on the sides of the cup very thin and sharp, adjacent lamellæ coalescing and fasciculating, the lamellæ thus formed again fasciculating and extending to the center, where they are twisted and elevated into a comparatively sharp crest. The quadrilateral form, convex tabulæ, deep fossette and fasciculated lamellæ are characteristics by which this species may be easily distinguished.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS PROFUNDA, *n. sp.*

Corallum simple, elongate turbinate, curved; exterior with numerous annulations; external striæ fine, distinct; height of corallum 70 mm.; diameter of the calix 25 to 35 mm., depth 25 to 40 mm.; there is usually a flat space at the bottom of the calix from one-half to three-fourths the diameter of the corallum at that point, but this feature is sometimes obsolete; number of lamellæ from 100 to 110, alternating in size, thickened at the margin, thin and sharp below the principal lamellæ extending to within 5 mm. of the center, coalescing with the tabulæ and leaving a smooth, nearly flat, space of 10 mm. in diameter. The proportional length and diameter is variable, individuals having calices of the same diameter varying in length from 35 to 80 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS NITIDA, *n. sp.*

Corallum simple, elongate turbinate, straight or slightly curved, exterior with numerous quite sharp annulations and constrictions caused by intermittent growth; external striæ very distinct; height of corallum 80 mm.; diameter of the calix 35 mm., depth 20 mm., somewhat campanulate, a space at the bottom from 10 to 15 mm. in diameter smooth, nearly flat; fossette consisting of a deep pit, its continuation extending on the sides but becoming obsolete before reaching the margin of the calix; number of lamellæ from 75 to 90, of nearly uniform size, thickened and rounded at the margin, becoming thin and alternating below; the principal lamellæ extend a short distance on the tabulæ, coalescing with it, not twisted. This species most closely resembles *Z. profunda*, but is a more solid form and the calix is not so deep.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS FREQUENTATA, *n. sp.*

Corallum simple, turbinate, curved; diameter of the calix 35 mm., depth 30 mm., the bottom of the cup formed by the tabulæ is convex, about 20 mm. in diameter, the fossette consists of a deep depression near the dextral margin of the tabulæ, not extending on the side of the calix; number of lamellæ from 90 to 100, alternating in size, the alternation being more distinct on the sides than near the margin, where they are thickened and rounded, becoming thin as they approach the center; the adjacent principal lamellæ fasciculate, the lamellæ thus formed, again fasciculating, coalescing and extending to the center, where they are slightly twisted. The tabulæ are elevated at the center as in the genus CLISIOPHYLLUM, but as all the other characters are those of ZAPHRENTIS the mere elevation of the center of the tabulæ could make no generic difference.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS DUPLICATA, *n. sp.*

Corallum simple, turbinate, attenuate below, straight or slightly curved, exterior with low rounded ridges of growth; external striæ fine, distinct; height of corallum 45 mm.; diameter of the calix 30 mm., depth 15 mm., sides nearly vertical, a flat space at the bottom 20 mm. in diameter; fossette deep, narrow, commencing near the center and extending to the anterior margin; number of lamellæ 110 near the margin of the cup thickened and rounded, all the lamellæ extending a short distance on the flattened space at the bottom; alternate lamellæ coalesce with the others, the lamellæ thus formed fasciculate and coalesce, continuing to the center, where they appear as low tortuous ridges; the tabulæ at the center are elevated, the outer portion bending downwards. This species can be distinguished from *Z. frequentata* by its finer lamellæ, which are thickened and coalescing at the center, and the narrow fossette.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS SENTOSA, *n. sp.*

Corallum simple, elongate turbinate or sub-cylindrical, very gradually increasing in diameter; fragments occur 30 mm. long of a nearly uniform diameter of 10 mm.; exterior with fine, distinct, rounded, concentric striæ and annulations, at quite regular distances apart; external striæ broad, prominent, each representing two lamellæ: on the annulations, corresponding in number to the longitudinal striæ, are curved spines, turning upwards; having at the base a diameter of 75 mm., length 3 mm., 4 or 5 in the space of 5 mm. Though there are numerous specimens of this species no perfect calix has yet been observed. This species may be distinguished from *Z. nodulosa* as follows: The spinules or conical nodes of that species occur only near the base, the ordinary forms expand quite rapidly, while in this species the increase in diameter is very gradual, the spines are more prominent and extend the whole length of the corallum.

Formation and locality. Corniferous limestone, Canada West.

ZAPHRENTIS CALCARIFORMIS, *n. sp.*

Corallum simple, narrowly turbinate, regularly curved; diameter of calices of individuals of the same height varying from 10 to 15 mm.; exterior with frequent undulations and low rounded annulations; height 25 mm.; fossette narrow, very deep, commencing at the center and continuing to the posterior margin; the lamellæ extending to its margin coalescing and forming vertical walls; number of lamellæ 50, alternating in size; at a distance of 2 mm. from the margin the smaller lamellæ coalesce with the others. This species is easily distinguished by the deep, narrow fossette situated on the anterior side, and the regular coalescing of the lamellæ at a short distance from its margin.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS CONSTRICTA, *n. sp.*

Corallum simple, turbinate, straight or slightly curved; exterior with frequent, sharp, narrow constrictions, giving to the corallum an invaginated appearance; external striæ very fine, distinct; height of corallum 50 mm., diameter of calix 35 mm., depth 20 mm., sides nearly vertical, tabulæ forming the floor of the calix, slightly convex, 20 mm. in diameter; fossette consisting of a deep depression at the dextral margin of the tabulæ, not extending on the sides of the calix; number of lamellæ 170, alternating in size, the smaller ones merely rudimentary, becoming obsolete at a very short distance below the margin; at equal distances from the fossette, on each side, are two lamellæ extending from the margin to the center, the adjacent lamellæ on each side converging to them; with this exception the lamellæ extend upon the flattened space at the bottom of the cup, many of them continuing to the center, coalescing and forming a narrow, curving crest. This species may be distinguished by the very fine lamellæ at the margin.

Formation and locality. Corniferous limestone, near Louisville, Kentucky.

ZAPHRENTIS ANNULATA, *n. sp.*

Corallum simple, elongate turbinate, sometimes gradually and regularly, at other times abruply curving, so that one portion is at right angles to the other; exterior with strong annulations, which are frequently at quite regular distances apart, and numerous moderately strong concentric striæ; tabulæ usually flat, curving downward toward the margin, extending nearly the entire diameter of the corallum; number of lamellæ 120, the smaller ones rudimentary.

Formation and localities. Corniferous limestone, Falls of the Ohio and Charlestown, Indiana.

ZAPHRENTIS KNAPPI, *n. sp.*

Corallum simple, sub-cylindrical, small, the attached portion broad, expanding only on one side of the apex, and giving to the corallum a very oblique growth; diameter essentially uniform throughout the entire length; exterior with numerous oblique wrinkles and annulations; longitudinal striations somewhat obscure; when decorticated, the internal striæ are broad and smooth, 7 in the space of 10 mm.; height of corallum 35 mm.; diameter of calix 15 mm.; number of lamellæ 25 to 30, of uniform size, extending nearly to the center, leaving a smooth, flat space 5 mm. in diameter. The great expansion on one side of the apex, the very oblique annulations and few lamellæ of this species are characteristics by which it is easily distinguished.

Formation and locality. Corniferous limestone, Charlestown, Indiana.

ZAPHRENTIS FOLIATA, *n. sp.*

Corallum simple, elongate turbinate, curved; surface with frequent narrow annulations and occasional constrictions; external striations distinct; height of corallum 70 mm., diameter of the calix 25 mm., depth 20 mm.; lamellæ about 70, of nearly uniform size, and thickened at the margins, alternating and thin below: the principal lamellæ fasciculate and extend to within a short distance of the center, leaving a smooth, concave space 3 mm. in diameter. In a transverse section the corallum appears as if composed of numerous thin, invaginated laminæ, in that respect resembling *Cyathophyllum exfoliatum*, but that species is much stronger and coarser in appearance.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS INCLINATA, *n. sp.*

Corallum simple, turbinate, straight or curved; in decorticated specimens the internal striæ are sharp and prominent; attached portion broad; height of corallum 50 mm.; diameter of the calix 25 mm., a space at the bottom 10 mm. in diameter slightly convex and very oblique to the axis of the corallum; number of lamellæ from 80 to 90, alternating in size, the smaller ones extending a short distance on the sides, the principal ones extending to the center, contorted and coalescing with the oblique tabulæ; fossette commencing a short distance from the center and continuing to the anterior margin.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS IRREGULARIS, *n. sp.*

Corallum simple, irregularly turbinate, straight or slighty curved; exterior with frequent prominent annulations and fine concentric striæ; external striæ fine, distinct. At irregular intervals are rows of spines having a diameter at the base of 1 m. and a length of from 2 to 3 mm., about 4 in the space of 5 mm.; number of lamellæ 90, alternating in size. This species may be distinguished by its prominent, irregular, annulations and the concentric rows of spines.

Formation and locality. Corniferous limestone, Charlestown, Indiana.

ZAPHRENTIS CONCAVA, *n. sp.*

Corallum simple, turbinate, regularly curved; height 25 mm.; diameter of the calix 20 mm., depth 10 mm., the sides of the calix quite abruptly descending to within 4 mm. of the center, where there is a narrow elevation surrounding an abrupt concavity of 5 mm. in diameter; fossette narrow, deep, indenting the margin of the concave space and extending to the anterior margin of the calix; number of lamellæ 70, alternating in size, a few extending to the center; tabulæ concave in the center, outer portion bending abruptly downward, intermediate portion convex.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS HERZERI, *n. sp.*

Corallum simple, turbinate, straight or curved; frequently, and especially in young individuals, the anterior side is flattened; base acute, quite regularly expanding to the calix; exterior with numerous rounded annulations and concentric striæ; external striæ, in all the individuals observed obscure; sometimes attaining a height of 40 mm., but usually 30 mm.; diameter of the calix from 15 to 20 mm., depth from 10 to 15 mm., more or less oval, usually flattened near the margin, then abruptly sloping to the center; fossette narrow, extending from the center nearly to the anterior margin; number of lamellæ from 60 to 70, alternating in size, the smaller ones not more than 5 mm. in length, the others extending to the center of the cup, not twisted or elevated. This species has been included with *Heliophyllum exiguum* by Dr. C. Rominger, Geological Survey of Michigan, but the form is entirely different and there are no traces of heliophylloid structure; from *Z. ungula* it may be distinguished by its less compressed form, and the entirely different character of the center of the calix.

Formation and locality. Corniferous limestone, Louisville, Kentucky.

ZAPHRENTIS CURVATA, *n. sp.*

Corallum simple, turbinate, curved, base acute, regularly expanding to the calix; exterior with numerous sharp annulations of growth and concentric striæ; external striæ distinct, 12 in the space of 10 mm.; height of corallum 40 mm., diameter of the calix 60 mm., depth 10 mm., sides nearly vertical, bottom flat, 15 mm. in diameter; fossette narrow, not extending to the margin, position variable; number of lamellæ from 60 to 70, alternating in size, more nearly uniform at the margin than below. The smaller lamellæ are 5 mm. in length, the others from that point are much more conspicuous than above, usually extending to within 5 mm. of the center, leaving a flat, smooth space of 10 mm. in diameter, but sometimes extending on the tabulæ, coalescing with it, and occasionally a few continuing to the center.

Formation and locality. Corniferous limestone, Crab Orchard, Kentucky.

ZAPHRENTIS GRAVIS, *n. sp.*

Corallum simple, turbinate, regularly curved or tortuous, gradually expanding; exterior with numerous sharp annulations and constrictions, caused by intermittent growth; external striæ very distinct, from 8 to 10 in the space of 10 mm., when decorticated presenting an invaginated, somewhat cystose appearance; height of corallum 70 mm., diameter of the calix 40 mm. Of the numerous individuals observed the sides of the calix are broken so that its true form cannot be ascertained; number of lamellæ from 60 to 70, alternating in size, the larger ones usually extending to within 5 mm. of the center, leaving a flat, smooth space of 10 mm. in diameter; occasionally a few extend to the center but are not prominent; tabulæ broad. This species most closely resembles *Z. curvata,* but is much more solid, and the lamellæ, as they approach the flat space at the bottom of the calix, are not so prominent.

Formation and locality. Corniferous limestone, Crab Orchard, Kentucky.

ZAPHRENTIS TRANSVERSA, *n. sp.*

Corallum simple, turbinate, curved, attached portion broad, not regularly expanding to the calix; decorticated specimens have numerous sharp annulations caused by intermittent growth, but not presenting an invaginated appearance; height of corallum 50 mm., diameter at the base 15 mm.; calix somewhat campanulate, diameter 30 mm., depth 15 mm. There are two narrow fossettes situated opposite each other (one more conspicuous than the other), commencing near the center and continuing to the margins; number of lamellæ from 75 to 90, alternating in size, about 5 of the principal lamellæ extend across the bottom of the calix, connecting with those of the opposite side, generally at right angles to the fossette, though sometimes oblique; the lamellæ situated between these coalesce with them a short distance from the center, the remaining larger lamellæ converge toward the center, extending to those crossing the bottom, their extremities coalescing and curving. This species is very characteristic and is easily distinguished from any other.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS ELEGANS, *n. sp.*

Corallum simple, turbinate, usually slightly compressed, acute at the base, regularly expanding to the calix; exterior with concentric wrinkles and undulations, external striæ distinct, 14 in the space of 10 mm.; when decorticated the internal striæ are usually broad, equal to one-half the number of the lamellæ; corallum usually about 70 mm. in height, diameter of the calix 30 mm., depth 20 mm., sides abrupt, an oval space at the bottom smooth or with the lamellæ faintly indicated; fossette usually dextral, consisting of a deep, elongate depression at the bottom of the cup, but faintly indicated on the sides; number of lamellæ from 80 to 90, alternating in size, thickened and sub-angular at the margin, becoming very thin and fragile below. This species may be distinguished from *Z. profunda* by its compressed form, shallower calix and finer lamellæ; from *Z. nitida* by its compressed form, narrower flattened space at the bottom of the calix and somewhat finer lamellæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS CONVOLUTA, *n. sp.*

Corallum simple, turbinate, straight or regularly curved, acute at the base, regularly expanding to the calix, slightly compressed, oblique; decorticated specimens presenting a somewhat smooth appearance; internal striæ not prominent; height of corallum 70 mm.; diameter of calix 40 mm., depth 25 mm., a space at the center 12 mm. in diameter flat and smooth; number of lamellæ 100, alternating in size, the smaller ones about 15 mm. long; usually from 2 to 4 adjacent principal lamellæ coalesce and fasciculate, becoming twisted and extending to within 6 mm. of the center; fossette obscure or obsolete. This species may be recognized by the conspicuous coalescing and fasciculating of the lamellæ and their decided twisted appearance after coalescing.

Formation and locality. Corniferous limestone, Falls of the Ohio.

ZAPHRENTIS CONTORTA, *n. sp.*

Corallum simple, turbinate, slightly and regularly curved; exterior quite smooth when decorticated; internal striæ fine and distinct, 14 in the space of 10 mm.; height of corallum 30 mm.; diameter of the calix 25 mm.; fossette sinistral, at the bottom deep, pyriform, narrower and less conspicuous on the sides; number of lamellæ from 90 to 100, alternating in size, smaller ones short, frequently coalescing with the others, which fasciculate, coalesce and extend to the center and are much twisted, presenting a very irregular appearance; tabulæ large, convex.

Formation and locality. Corniferous limestone, Canada West.

ZAPHRENTIS VENUSTA, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, acute at the base, regularly and quite rapidly expanding to the calix; exterior with concentric wrinkles and undulations of growth; external striæ distinct, 10 in the space of 10 mm.; height of corallum 60 mm., diameter of the calix 40 mm., depth 20 mm., sides nearly vertical, walls very thin; tabulæ broad, concave at the center, the outer portion bending downward, the intermediate space convex; fossette sinistral, narrow, not conspicuous; number of lamellæ 108, thin, of nearly uniform thickness, alternating in length, the principal ones extending nearly to the center, leaving a small oval concave space about 6 mm. in length.

Formation and locality. Corniferous limestone, Falls of the Ohio.

GENUS ELASMOPHYLLUM, *nov. gen.*

Corallum simple, turbinate, lamellæ extending to the center, twisted or not, interlamellar cysts continuing to the center; no tabulæ.

ELASMOPHYLLUM ATTENUATUM, *n. sp.*

Corallum simple, elongate turbinate, straight or very slightly curved, height 130 mm., acute at the base, regularly expanding to calix; exterior with numerous fine, distinct, concentric striæ and annulations, external striæ conspicuous; when decorticated the internal striæ are very obscure; number of lamellæ about 60, alternating in size, the principal ones extending to the center and twisted; no tabulæ; the vesicles between the lamellæ numerous and extending to the center; the sides of the lamellæ with conspicuous longitudinal striæ. Several individuals of this species have been observed, but the calix of each is imperfect so that its true form cannot be ascertained, but the species is easily distinguished by its straight or nearly straight regularly expanding form, the strong lamellæ, the vesicles extending to the center and the absence of tabulæ.

Formation and locality. Corniferous limestone, New York and Canada.

CYATHOPHYLLUM, GOLDFUSS.

CYATHOPHYLLUM (ELASMOPHYLLUM) INTERVESICULUM, *n. sp.*

Corallum simple, elongate turbinate or sub-cylindrical, exterior with numerous narrow annulations and constrictions; external striæ very distinct, 6 in the space of 10 mm.; when decorticated the corallum presents an invaginated appearance; internal striæ irregular and interrupted; height of corallum 200 mm. or more; calix infundibuliform, diameter 50 mm., depth 40 mm.; fossette extending from near the center to the margin, moderately conspicuous; number of lamellæ 110, of uniform size, extending to or nearly to the center; interlamellar cysts prominent, more conspicuous than the lamellæ, which they sometimes almost entirely obscure.

The tabulæ are not distinct and it is possible that they do not exist in which case this species must be placed in the genus ELASMOPHYLLUM.

Formation and locality. Corniferous limestone, Leroy, New York.

CYATHOPHYLLUM EXFOLIATUM, *n. sp.*

Corallum simple, elongate turbinate or sub-cylindrical, exterior with concentric wrinkles and undulations of growth; external striæ conspicuous, 6 in the space of 10 mm.; length of an adult individual from 80 to 90 mm.; diameter of the calix 35 mm., depth 25 mm., sides quite regularly sloping to the center; number of lamellæ 60, broad, rounded and of uniform size at the margin, becoming thinner and alternating below, the principal lamellæ extending to the center, where they are twisted, not elevated. In a section the corallum has the appearance of being formed of very thin superimposed laminæ; when partially decorticated the exterior has the appearance of a *Cystiphyllum;* these characters and the flat, fragile appearance of the lamellæ near the margin readily distinguish it from any other species.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM CANALICULATUM, *n. sp.*

Corallum simple, elongate turbinate or sub-cylindrical, massive; in decorticated specimens internal striæ irregular, interrupted; the largest fragment observed has a height of 150 mm., diameter for nearly the entire length 50 mm. From the nearly uniform diameter of this specimen it is evident that the length of a perfect individual would be much greater than that given above; number of lamellæ about 220, alternating in size, the smaller ones being scarcely more than rudimentary, the principal ones continuing to the bottom of the calix, where there is an elevation 40 mm. in length and 20 mm. in breadth; where the lamellæ are broken away it has an elevation of about 10 mm., where they are perfect it is slightly elevated, and along the middle is a deep depression, which is a continuation of the lateral fossette; the bottom of the calix has a close resemblance to that of *Zaphrentis compressa*, but in other respects the two forms are extremely different.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM IMPOSITUM, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, gradually expanding; exterior with frequent sharp constrictions, caused by intermittent growth, giving to the corallum the appearance of being composed of a series of invaginated calices; external striæ conspicuous; height of corallum 80 mm.; diameter of the calix 40 mm., depth 30 mm., sides quite regularly sloping to the center; a narrow fossette on both anterior and posterior sides connected by a shallow depression; number of lamellæ from 100 to 110, alternating in size, somewhat thickened near the margin, becoming very thin and sharp on the sides of the calix; principal lamellæ extending to the depression at the bottom of the calix; on the sides of the lamellæ, at right angles to the margin are numerous rounded striæ, sometimes projecting beyond the margins and forming denticulations, but usually causing the margin to appear obscurely crenulated; the striæ have the same direction as those of HELIOPHYLLUM, but they are not distinct or continuous enough to place the species under that genus.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM DEPRESSUM, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, exterior with annulations and undulations of growth and very prominent longitudinal striæ, of which there are 8 in the space of 10 mm.; height of corallum 80 mm., regularly expanding; diameter of calix 40 mm., depth of anterior side 35 mm., sides parallel with the exterior wall, a space at the bottom 20 mm. in diameter flat, with a deep depression at the center; the fossette consists of a deep depression sinistral to the center, its continuation on the side is obscurely indicated; number of lamellæ from 80 to 90, alternating in size, the smaller ones very thin, extending to the flattened space at the bottom of the calix, the larger ones fasciculating and extending to the center where they are slightly twisted; the interlamellar cysts are prominent, elongate, sometimes obscuring the smaller lamellæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM ARCTIFOSSA, *n. sp.*

Corallum simple, turbinate straight or curved, sometimes regularly expanding from a conical apex, at other times the diameter at the base is greater than at a short distance above; exterior with concentric wrinkles and moderately prominent annulations; height of the corallum 80 mm.; calix broadly campanulate, having a diameter of 50 mm., and a depth of 25 mm.; fossette, deep, narrow, commencing about 8 mm. from the center and continuing to the anterior margin; number of lamelæ

120, of nearly uniform thickness, alternating in length, the larger ones as they approach the bottom fasciculate, a few continue to the center, coalescing with the tabulæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM VESICULATUM, *n. sp.*

Corallum simple, elongate turbinate, attenuate below, curved, regularly expanding to the calix, exterior with gentle undulations of growth; height 35 mm.; diameter of calix 20 mm., depth 15 mm., sides regularly sloping to the center; number of lamellæ 60, slightly alternating in size, very thin, the principal ones extending to the center of the calix, not twisted. The interlamellar cysts are small, but very distinct, giving to the corallum somewhat the appearance of a CYSTIPHYLLUM.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM BULLATUM, *n. sp.*

Corallum simple, turbinate, attenuate below; calix broadly expanded; external striæ very distinct, 12 in the space of 10 mm.; when decorticated the striæ are smooth, 6 in the space of 10 mm; tabulæ broad, flat; height of corallum 60 mm.; diameter of calix 35 mm., having at the margin 8 lamellæ in the space of 10 mm., alternating in size, the principal ones becoming very thin and prominent below; at the bottom is a flat space 10 mm. in diameter, sometimes smooth and sometimes with the lamellæ faintly indicated; the interlamellar cysts are elongate, very prominent, frequently entirely obscuring the smaller lamellæ.

Formation and locality. Corniferous limestone, Canada West.

CYATHOPHYLLUM COHÆRENS, *n. sp.*

Corallum simple or compound, elongate turbinate; exterior with undulations of growth, striæ fine, distinct; height of corallum 45 mm.; calix shallow campanulate, with a diameter of from 15 to 20 mm., depth 6 mm.; number of lamellæ 80, of nearly uniform size at the margin, alternating below, the larger ones extending to the center where they are twisted elevated and forming a false columella of about 3 mm. in diameter; on the inner surface of the calix are numerous small cysts which sometimes obscure the lamellæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM SEPTATUM, *n. sp.*

Corallum simple, elongate turbinate or sub-cylindrical, exterior with frequent constrictions, caused by intermittent growth, and numerous concentric wrinkles; when decorticated the margins of the lamellæ with the intermediate structure are usually shown; height of corallum 60 mm., diameter of the calix 20 mm., number of lamellæ 60, of nearly uniform thickness, alternating in length, the principal ones extending to within a short distance of the center, leaving a smooth flat space 4 mm. in diameter.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM PERFOSSULATUM, *n. sp.*

Corallum simple, broadly turbinate, robust, sometimes contracted above, exterior with numerous concentric wrinkles and striations, with constrictions caused by intermittent growth; diameter of the calix 50 mm., depth 25 mm., quite regularly concave; fossette deep, broad, extending from near the center to the margin; number of lamellæ 75 alternating in size, the smaller ones extending only a short distance from the margin, the others are very thin, all extending to within a short distance of and a few quite to the center, coalescing and forming a narrow elongate crest; margins of lamellæ denticulate, no striæ on the sides; interlamellar space strongly vesiculose.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM CONCENTRICUM, *n. sp.*

Corallum simple, turbinate, regularly curved, solid, exterior with undulations of growth and numerous fine concentric rugose striæ; longitudinal striæ distinct; height of corallum 50 mm.; diameter of the calix 30 mm., depth 20 mm., sides quite regularly concave, a space at the bottom 10 mm. in diameter flat; fossette extending from near the center to the anterior margin; number of lamellæ 100, of nearly uniform size at the margin of the calix, alternating below; in some specimens the principal lamellæ extend to the margin of the flattened area, ending abruptly, leaving the central portion smooth, in others they extend to the center, though abruptly becoming much smaller at the margin of the flat space; when decorticated the internal striæ are crenulated or united by septa.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM SCALENUM, *n. sp.*

Corallum simple, turbinate, compressed, acute at the base, regularly expanding to the calix, exterior with undulations and constrictions caused by intermittent growth; striæ distinct, 9 or 10 in the space of 5 mm.; calix very oblique; length of posterior side of corallum 25 mm. of anterior 75 mm.; diameter of calix 50 mm., depth 20 mm., quite regularly concave; fossette conspicuous, commencing at the center and continuing to the anterior margin; number of lamellæ 110, alternating in size; within a short distance of the center the principal lamellæ coalesce and fasciculate, each fascicle being composed of from 2 to 7 lamellæ; after coalescing they continue nearly to the center and become twisted. When the lamellæ are perfect they have, at their margins, slender spinules about .75 mm. in length, 8 in the space of 5 mm., forming a very prominent feature, but most conspicuous on the intermediate smaller lamellæ, the margins of the principal ones usually being broken. On the sides of the lamellæ are rounded striations continuing a short distance from the margin, but not of sufficient prominence or extent to place the species in the genus HELIOPHYLLUM.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYATHOPHYLLUM PERPLICATUM, *n. sp.*

Corallum simple, turbinate, curved, obtuse at the base, quite rapidly expanding for a short distance, then continuing of nearly uniform diameter; exterior with shallow grooves, concentric wrinkles and very distinct, fine, concentric striæ; longitudinal striæ distinct, 8 in the space of 5 mm.; when decorticated it presents a somewhat cystose appearance; height of corallum 60 mm.; diameter of the calix 30 mm., depth 10 mm., a space at the bottom 10 mm. in diameter, slightly convex and corrugated; fossette obscure or obsolete; number of lamellæ 75, alternating in size, near the margin of the cup thickened and angular, thin below; the principal lamellæ continue to the center on the convex space at the bottom becoming interrupted and having the appearance of corrugations.

Formation and locality. Corniferous limestone, Crab Orchard, Kentucky.

CYATHOPHYLLUM ROBUSTUM, *n. sp.*

Corallum simple, elongate turbinate or cylindrical, when decorticated appearing as if formed of invaginated calices, each of which consists of thin, superimposed laminæ; external costæ very distinct, 4 or 5 in the space of 10 mm.; concentric striæ coarse, distinct; when decorticated the internal costæ have numerous transverse elevations at irregular distances apart caused by the interlamellar cysts. The largest fragment observed has a length of 220 mm. and a diameter of 110 mm. For a space of from 20 to 30 mm. from the margin the sides of the calix are sloping at an angle of about 45° to the axis of the corallum, becoming vertical, then becoming flat for a width of 10 mm., thence abruptly descending, frequently to a depth of 30 mm.; this deep depression has at first a diameter of about 20 mm., gradually narrowing below; number of lamellæ from 100 to 130, alternating in size, the principal ones extending nearly to the flat tabula at the bottom of the calix; inter-lamellar cysts very prominent, frequently obscuring the lamellæ, near the margin the lamellæ sometimes becoming obsolete.

Formation and locality. Corniferous limestone, near Leroy, New York.

BLOTHROPHYLLUM, BILLINGS.

BLOTHROPHYLLUM MULTICALICATUM, *n. sp.*

Corallum simple, elongate turbinate or sub-cylindrical; exterior with numerous abrupt constrictions caused by intermittent growth, and sharp annulations bearing quite prominent spinules; external costæ distinct; diameter of central axis 25 mm., of tabulæ 15 mm.; calix 40 mm. wide; for a space of 10 mm. from the margin the sides are flat, then vertical, a space at the bottom 20 mm. in diameter flat smooth, elevated; number of lamellæ 120, alternating in size, the larger ones extending to the margin of the elevated tabulæ at the bottom of the cup; interlamellar cysts elongate, conspicuous, frequently partially obscuring the lamellæ. This species may be distinguished from *B. decorticatum* by the different form of the calix, finer and less conspicuous lamellæ, and more compact arrangement of the expanded calix margins.

Formation and locality. Corniferous limestone, Canada West.

BLOTHROPHYLLUM PAPULOSUM, *n. sp.*

Corallum simple, sub-cylindrical, consisting of numerous invaginated calices, each of which is formed of thin, superimposed laminæ exterior with numerous distinct, concentric striæ, of which there are about 30 in the space of 5 mm., frequently arching on the external costæ, which are very prominent. The largest fragment observed has a length of 170 mm. and a nearly uniform diameter of 50 mm.; diameter of central axis 25 mm.; calix, shallow, campanulate, a space at the bottom from 10 to 15 mm. in diameter, flat, smooth; number of lamellæ from 90 to 100, which are nearly uniform in size near the margin of the cup, flattened, broad, alternating in size and becoming thin as they approach the center; principal lamellæ extending to the flat area at the bottom. On the thickened lamellæ, toward the margin, are numerous prominent pustules. This species may be distinguished from *B. decorticatum* as follows: the expanded calix margins are much more numerous, more compact and more distinctly consist of thin, superimposed laminæ; the lamellæ toward the margin are broad, flattened, and with very prominent pustules; the epitheca is never continuous over the whole length of the corallum.

Formation and locality. Corniferous limestone, Leroy, New York.

BLOTHROPHYLLUM SINUOSUM, *n. sp.*

Corallum simple, elongate, nearly cylindrical; all the specimens observed are in a decorticated condition; diameter from 15 to 20 mm.; fragments of 150 mm. in length occur of uniform diameter; number of lamellæ from 60 to 70, alternating in size, the smaller ones being about one-half the thickness of the others, the principal ones extend nearly to the center of the calix, the extremities becoming slightly twisted; a space of from 2 to 3 mm. in diameter at the center smooth; the tabulæ are slightly concave, the outer portion bending abruptly downward at right angles so that in a longitudinal section the broken edges of the outer portion appear as a vertical wall, resembling DIPHYPHYLLUM.

Formation and locality. Corniferous limestone, Falls of the Ohio.

BLOTHROPHYLLUM PROMISSUM, *n. sp.*

Corallum simple, cylindrical, elongate, diameter from 15 to 25 mm.; number of lamellæ 70, alternating in size; at the bottom of the calix is a flat area, either smooth or with the lamellæ but faintly indicated. In the decorticated condition in which this species and *B. sinuosum* occur it is not possible to separate them by external characters, but the calix in one species has the lamellæ extending nearly to the center, abruptly ending and the extremities twisted, and the other having a broad, smooth space at the bottom of the calix and lamellæ not twisted; these characters render a distinction of the species easy.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM, HALL.

HELIOPHYLLUM ALTERNATUM, *n. sp.*

Corallum simple, turbinate, usually straight, height 45 mm.; diameter of calix 35 mm., depth 20 mm., sides nearly vertical, bottom flat; number of lamellæ from 70 to 80, alternating in size, the larger ones being very prominent, extending nearly to the center of the cup, coalescing and forming, small, irregular, central elevations. At the margin of the calix the lamellæ are thick, rounded, growing thinner as they approach the bottom of the calix; denticulations of the lamellæ prominent, appearing as spinules, six in the space of 5 mm. This species may be distinguished by the pronounced difference in the size of the lamellæ and the nearly vertical sides of the calix.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM INCRASSATUM, *n. sp.*

Corallum simple, turbinate, height 40 mm.; diameter of the calix 30 mm., depth 15 mm., sides near the margin flat or rounded, then quite abruptly descending, a space at the bottom 10 mm. in diameter flat; fossette conspicuous; number of lamellæ 56, alternating in size, the smaller ones being about one-third the thickness of the others; the greater portion of the lamellæ extend only to the flat space at the bottom of the calix, from that point about 15 are very much thickened and extend to the center, straight or slightly flexuous; denticulations moderately prominent, from 6 to 8 in the space of 5 mm., near the margin wide, becoming narrow and spiniform below.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM ACUMINATUM, *n. sp.*

Corallum simple, turbinate, regularly curved, length of anterior side 50 mm., of posterior 25 mm.; diameter of the calix 40 mm., depth 30 mm., a space at the bottom, 25 mm. in diameter, depressed convex; fossette conspicuous, extending from the convex space at the bottom to the anterior margin; number of lamellæ 80, alternating in size, margins broadly angular; the larger ones extend upon the tabulæ, but do not reach the center; denticulations very prominent, sometimes extending nearly 1 m. beyond the margins of the lamellæ, from 3 to 4 in the space of 5 mm.

Formation and locality. Corniferous limestone, Ontario.

HELIOPHYLLUM VENATUM, *n. sp.*

Corallum simple, turbinate, regularly curved; exterior with sharp ridges of growth; height of corallum 40 mm.; diameter of calix 35 mm., depth 15 mm., a space at the bottom, 20 mm. in diameter, depressed convex; fossette conspicuous, situated on the anterior side; number of lamellæ 90, alternating in size, the larger ones continuing to the center of the calix, becoming flexuous or slightly twisted, adjacent ones frequently coalescing; denticulations prominent, 5 in the space of 5 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM IMBRICATUM, *n. sp.*

Corallum sub-cylindrical or elongate turbinate, gradually expanding; exterior with numerous sharp ridges of growth; when decorticated the internal costæ present a peculiar imbricated appearance, the imbrication being toward the base; diameter of calix from 30 to 40 mm., depth 15 mm., a space at the bottom 15 mm. in diameter flat; fossette conspicuous, extending from near the center to the margin; number of lamellæ 70, of nearly uniform size at the margin, alternating on the sides of the calix, the larger ones, extending to the center, straight or slightly flexuous: denticulations spiniform, prominent, 3 in the space of 5 mm. This species may be distinguished from *H. verticale* by the imbricated costæ and the extension of the lamellæ to the center of the cup.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM VERTICALE, *n. sp.*

Corallum simple, elongate turbinate, straight or curved, very gradually expanding; exterior with numerous sharp ridges of growth; height from 50 to 100 mm.; diameter of the calix from 25 to 30 mm., depth 15 mm., sides abruptly descending, a space at the bottom from 10 to 15 mm. in diameter flat or slightly concave; number of lamellæ from 75 to 80, alternating in size, the larger ones extending to within a short distance of the center, abruptly coalescing with the tabulæ, leaving a flat or concave smooth space at the center; denticulations very prominent, spiniform, 6 in the space of 5 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM INVAGINATUM, *n. sp.*

Corallum elongate, gradually expanding; when decorticated it has the appearance of consisting of a series of invaginated calices; height of an adult individual thirteen centimetres; diameter of calix 50 mm. depth 30 mm.; when the lamellæ are perfect the calix is somewhat bell-shaped, when broken away the sides of the calix are more nearly vertical and the bottom is flat or elevated at the center; number of lamellæ 90, of nearly uniform size at the margin, alternating on the sides, principal lamellæ extending to the center, flexuous or slightly twisted, very thin and prominent; from 5 to 7 denticulations in the space of 5 mm. extending to within 10 mm. of the center of the calix.

Formation and locality. Corniferous limestone, Falls of the Ohio

HELIOPHYLLUM ÆQUALE, *n. sp.*

Corallum simple, elongate, straight or curved; surface with angular ridges of growth; height of corallum 14 centimetres; diameter of calix 40 mm., depth 30 mm., somewhat bell shaped; number of lamellæ 90, of uniform size, very thin, a part of them extending to the center are twisted and elevated; denticulations uniform in width with the lamellæ, 8 in the space of 5 mm.; fossette obscure. This species may be distinguished by the deep calix, very thin, uniform, closely arranged lamellæ and thin denticulations.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM FASCICULATUM, *n. sp.*

Corallum simple, elongate turbinate; height 130 mm.; diameter of the calix 50 mm.; a space at the bottom of the calix from 10 to 15 mm. in diameter is concave-conical; adjacent to this depressed space is a flat area, the depressed and flat portions being 30 mm. in diameter; fossette small; number of lamellæ 110, alternating in size, the smaller lamellæ extend only to the flattened area, the larger lamellæ extend to the margin of the concave conical space, and a few, very much thickened, extend to the center; 6 denticulations in the space of 5 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM ANNULATUM, *n. sp.*

Corallum simple, elongate, gradually expanding, usually compressed; exterior with prominent, rounded or subangular annulations of growth, which are sometimes situated at quite regular distances apart; there are also concentric wrinkles and fine striations; longitudinal striæ distinct; number of lamellæ from 60 to 75; height of corallum from 100 mm. to 150 mm. or more; often extremely attenuate, and frequently flattened from compression. In many examples the exterior does not well preserve evidence of the generic relations of the fossil, but longitudinal sections reveal, in a beautiful manner, the heliophylloid structure.

Formation and localities. Corniferous limestone, Scott and Clarke counties, Indiana, and Youngs' farm, Erie county, New York.

HELIOPHYLLUM COMPACTUM, *n. sp.*

Corallum small, sub-cylindrical or elongate turbinate, straight or slightly curved, gradually expanding; exterior with broad undulations of growth, also concentric wrinkles and fine striations; height of corallum 50 mm.; calix 20 mm. in diameter, depth 15 mm., sides nearly vertical, abruptly expanding near the margin; a space at the bottom of the calix 8 mm. in diameter, flat; number of lamellæ 70, of nearly uniform size at the margin of the calix, alternating on the sides; the principal lamellæ extend on the flattened space at the bottom abruptly coalescing with the tabulæ, leaving a smooth area 5 mm. in diameter; denticulations fine, 10 in the space of 5 mm.; no fossette; the tabulæ are nearly flat at the middle, bending abruptly downward near their outer margins.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM DENTATUM, *n. sp.*

Corallum turbinate, straight or slightly curved; exterior with strong concentric wrinkles and striations; height of corallum 50 mm., diameter of calix 40 mm., depth 20 mm.; an elevated space at the bottom 10 mm. in diameter; fossette small; number of lamellæ 80, thin, of nearly uniform size at the margin of the calix, alternating below; the principal lamellæ extending to the center of the cup twisted and elevated, forming a false columella; denticulations very prominent, 4 or 5 in the space of 5 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM FECUNDUM, *n. sp.*

Corallum small, increasing by calicular gemmation, sometimes connected for nearly their entire length; height of an adult individual 25 mm.; diameter of calix 13 mm.; for a distance of 4 mm. from the margin the walls of the cup are nearly flat, then abruptly descending to a plane, smooth area 4 mm. in diameter at the bottom of the calix; number of lamellæ 70, of uniform size, extending to the flat space at the bottom of the calix; denticulations minute; no fossette. From one calix, only 12 mm. in diameter, proceed 5 buds. From *H. gemmatum* it is easily distinguished by its smaller size and entirely different form of calix.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM GEMMATUM, *n. sp.*

Corallum rapidly increasing in numbers by calicular gemmation; height usually from 25 to 30 mm.; diameter of calix 20 mm., depth 10 mm.; sides quite regularly sloping; a space at the bottom of the calix 3 mm. in diameter flat, smooth; number of lamellæ 70, sometimes of uniform size, at others alternating, extending to the flat space at the center of the calix; denticulations minute, 16 in the space of 5 mm.; fossette small. In nearly all the individuals observed there are from 3 to 5 buds growing from the parent corallum.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM LATERICRESCENS, *n. sp.*

Corallum sub-cylindrical, slightly compressed, simple or compound, increasing by lateral gemmation; exterior with numerous sharp annulations of growth, concentric wrinkles and fine striæ; largest specimen observed 10 centimetres in length, having a nearly uniform diameter of 30 mm.; depth of calix 15 mm., somewhat bell-shaped, center elevated; number of lamellæ from 90 to 100, uniform in size near the margin of the cup, alternating below; the principal ones, extending to the center of the cup, are twisted and elevated, forming a false columella; denticulations fine, 18 in the space of 5 mm. In its manner of growth, deep calix with false columella, very fine lamellæ and denticulations it is easily distinguished from any other species.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM POCILLATUM, *n. sp.*

Corallum simple or compound, slender, elongate, very gradually increasing in diameter; height of corallum 70 mm.; diameter of calix 20 mm., depth 15 mm., sides regularly sloping toward the center; number of lamellæ 70, alternating in size. Sometimes there is a small smooth area at the bottom of the cup, at other times the principal lamellæ continue to the center; denticulations minute, distinct. This species most closely resembles *H. imbricata* and *H. verticale*, but may be distinguished by its more slender form, different appearance when decorticated, finer lamellæ and in the form of the calix.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM DISTANS, *n. sp.*

Corallum simple, turbinate, straight or curved; height 45 mm.; diameter of the calix 45 mm., depth 20 mm.; the walls of the calix for an area of 8 mm. from the margin are flat, then quite abruptly descending, a space at the center 15 mm. in diameter gently convex; number of lamellæ 70, of uniform size at the margin, alternating below, the principal lamellæ extending nearly to the center of the calix; denticulations thin, 3 in the space of 5 mm. This species in its general form and appearance is similar to *H. Halli*, but the lamellæ are much thinner and the denticulations are at a greater distance apart, there being in that one six in the same space occupied by three in this species.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM LINEOLATUM, *n. sp.*

Corallum simple, sub-cylindrical, very gradually increasing in diameter. The specimens observed are compressed, though this may be due to accident; diameter of calix 20 mm., depth 20 mm., sides nearly vertical, an area at the center 10 mm. in diameter moderately convex; fossette narrow, deep, extending from the convex central space to the margin of the calix; number of lamellæ 80, alternating in size, the larger ones extend to the center of the calix, and one or more continue across from one margin to the other; the striæ on the sides of the lamellæ are very fine, there being frequently 20 in the space of 5 mm., and though the margins of the lamellæ are crenulated by each one of the striæ, it is only at somewhat irregular intervals that they are prolonged into denticulations.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM AEQUUM, *n. sp.*

Corallum simple, more or less curved, when decorticated presenting a decidedly invaginated appearance; height 50 mm., diameter of the calix 30 mm., depth 20 mm., the margin sub-quadrangular in outline, sides nearly vertical, an area at the bottom 15 mm. in diameter flat, smooth; number of lamellæ 90, alternating in size, the larger ones being faintly indicated for a short distance on the tabulæ at the bottom of the calix; fossette narrow, deep. This species may be distinguished by the broad, smooth area at the bottom of the calix.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM SCYPHULUS, *n. sp.*

Corallum simple, turbinate, regularly curved; surface with frequent narrow annulations of growth and fine striations, sometimes with comparatively broad undulations. The greater portion of the individuals observed are from 20 to 25 mm. in height; diameter of the calix about equal to the height, depth 15 mm.; a space at the bottom of the calix, when the lamellæ are perfect, flat or slightly convex; fossette situated anteriorly, not extending to the margin; number of lamellæ 60, of uniform size at the margin, alternating below, the larger ones extending to the center, slightly twisted, occasionally one or more extending from margin to margin; center of tabulæ flat, the outer portion bending abruptly downward; from 3 to 5 denticulations in the space of 5 mm. at a distance from the margin very prominent and spiniform. This species differs from *H. Halli* in the form of the calix, thinner lamellæ and more distant denticulations.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM TENUIMURALE, *n. sp.*

Corallum simple, turbinate, curved, usually decorticated; internal costæ prominent; height of corallum 30 mm.; diameter of calix 25 mm., depth 15 mm., sides abruptly sloping, leaving a convex space at the bottom 10 mm. in diameter; fossette extending from near the center to the anterior margin of the calix; in continuation of the fossette a depression extends across the elevated space at the bottom of the calix connecting with a rudimentary fossette on the posterior side; number of lamellæ 90, alternating in size, the smaller ones rudimentary, the larger ones extending to the center of the calix where they are elevated and twisted; 7 or 8 denticulations in the space of 5 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM NETTELROTHI, *n. sp.*

Corallum simple, elongate turbinate, regularly or irregularly curved. The numerous individuals observed are decorticated; the internal structure is as follows: a central area occupied by the flat portion of the tabulæ; the tabulæ turn upward and for a distance of 10 or 15 mm. are nearly vertical, forming a cylindrical cavity, then turning outward and downward; in one individual the flat portion of the tabulæ is 8 mm. in diameter; a space 30 mm. in diameter is occupied by the tabulæ and lamellæ without intermediate structure; then occur small intermediate cysts whose direction is toward the margin, and the heliophylloid rays, having a direction toward the center; the outer area consists of a series of the projecting margins of the invaginated calices, the lamellæ of which have, on their sides and margins, prominent rays and denticulations, but no vesicles. A calix 40 mm in diameter slopes quite abruptly to the depth of 15 mm., it is then flat for a space of 8 mm., then abruptly turns downward and continues vertically for a distance sometimes of 30 mm.; transverse section of the latter portion usually oval; number of lamellæ from 90 to 100, alternating in size, the larger ones continuing to the center of the cup, though somewhat obscured on the lower portion of the vertical wall; denticulations prominent, 6 or 7 in the space of 5 mm.; on the sides of the lamellæ are oblique, coarse, rounded striations; these end abruptly at two conspicuous longitudinal grooves, from which to the outer area, a space of about 5 mm., are numerous small cysts; on the outer area are prominent heliophylloid striæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM SORDIDUM, *n. sp.*

Corallum small, simple, turbinate, height from 15 to 20 mm., diameter of the calix equal to the height. Numerous individuals of this species have been observed, but they are invariably decorticated and the margins of the calix broken away, so that its true form cannot be accurately determined; a conspicuous fossette extends from near the center to the anterior margin; frequently, along the middle of the fossette, there is a prominent lamella; number of lamellæ from 80 to 90, alternating in size, the larger ones thick, fasciculating, coalescing and extending to the center, where they are twisted. Owing to the breaking away of the lamellæ near the margin the denticulations seldom appear; it is, however, easily recognized as a HELIOPHYLLUM from the character of the internal costæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM DENTICULATUM, *n. sp.*

Corallum simple, turbinate, curved, sometimes in more than one direction; exterior with numerous concentric wrinkles and fine striæ; external costæ coarse, prominent; height of corallum 45 mm.;

diameter of the calix 17 mm., depth 10 mm., broadly bell-shaped; fossette commencing near the center and extending to the margin; number of lamellæ 50, alternating in size, the principal ones fasciculating, coalescing and extending to the center.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM CAMPANIFORME, *n. sp.*

Corallum simple, turbinate, robust, straight or curved; proportional diameter of individuals of the same height variable; exterior with concentric wrinkles and undulations; no decided irregularities of surface; external costæ very distinct; when decorticated the internal costæ appear as if composed of thin, imbricating laminæ; dimensions of an adult specimen, height 70 mm., diameter of the calix 60 mm., depth 35 mm., broadly bell-shaped; number of lamellæ 110, of nearly uniform size near the margin, alternating below; the principal lamellæ fasciculating and extending to the center of the calix, where they are somewhat twisted, but not elevated; 5 or 6 denticulations in the space of 5 mm. Some of the individuals present a coarser aspect than others.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM FISSURATUM, *n. sp.*

Corallum simple, turbinate, regularly curved; exterior comparatively smooth, longitudinal striæ distinct, length of posterior side 15 mm., of anterior side 30 mm.; diameter of the calix 25 mm., depth 12 mm., sides parallel with the exterior of the corallum, a space at the bottom 10 mm. in diameter essentially flat; fossette narrow, conspicuous, extending from the center to the anterior margin; number of lamellæ 80, the larger ones extending sometimes to the center, at other times leaving a flat or concave smooth space from 6 to 8 mm. in diameter, denticulations fine; in one individual in place of the denticulations there are notches in the lamellæ; this feature may be due to the breaking away of the denticulations; tabulæ at the center concave, the outer portion bending abruptly downward, the intermediate space elevated. The form of this species is very similar to *Heliophyllum* (*Zaphrentis*) *corniculum*, but the denticulations are much more minute and the bottom of the calix is quite different.

Formation and locality. Corniferous limestone, Falls of the Ohio.

HELIOPHYLLUM CANCELLATUM, *n. sp.*

Corallum simple, broadly turbinate, acute at the base, regularly expanding to the calix; length of posterior side 10 mm., of anterior 25 mm.; diameter of calix 20 mm., depth 10 mm., quite regularly concave; number of lamellæ 110, the larger ones sometimes continuing to the center, not elevated or twisted; at other times there is a flat, smooth space at the center of about 5 mm. in diameter; on the sides of the lamellæ, at right angles to the margin, are fine striations, about 15 in the space of 5 mm., there are also longitudinal striations; near the margin of the calix the lamellæ are denticulated, but on the sides they are only obscurely crenulate or smooth. In general form this species is very similar to *H. scyphulus*, but that species has very prominent spine-like denticulations.

Formation and locality. Corniferous limestone, New York.

DIPHYPHYLLUM, LONSDALE.

DIPHYPHYLLUM ADNATUM, *n. sp.*

Corallum sub-cylindrical, simple or compound, increasing by lateral gemmation, frequently in contact for their entire length; exterior with very regular annulations and concentric striæ; longitudinal striæ distinct; diameter varying from 12 to 20 mm.; calix bell-shaped, depth about 10 mm.; number of lamellæ 50, of uniform thickness, alternate lamellæ continuing to internal wall; space inclosed by vertical wall, 3 mm. in diameter.

Formation and locality. Corniferous limestone, Falls of the Ohio.

DIPHYPHYLLUM CYLINDRACEUM, *n. sp.*

Corallum cylindrical, growing socially but not in contact, increasing by lateral gemmation, usually distant from each other from 5 to 10 mm.; external costæ distinct, annulations and constrictions very strong; number of lamellæ 45 to 50; space inclosed by interior wall 2 mm. in diameter. This species most nearly resembles *Diphyphyllum adnatum*, but the manner of growth is different, individuals of this species being always more or less separated, while in that one they are in contact usually their entire length.

Formation and locality. Corniferous limestone, Falls of the Ohio.

DIPHYPHYLLUM APERTUM, *n. sp.*

Corallum simple, sub-cylindrical, straight or curved, gradually or more rapidly expanding; when decorticated presenting a distinct invaginated appearance; length of one individual 60 mm.; calix bell-shaped, diameter 20 mm., depth 10 mm.; number of lamellæ from 60 to 70, of nearly uniform size at the margin, alternating below, the principal ones extending to the vertical internal wall; denticulations prominent, 10 in the space of 5 mm.; inclosed internal area oval or horse shoe-shaped, from 4 to 6 mm. in diameter, anterior side indented by a deep, narrow fossette.

Formation and locality. Corniferous limestone, Falls of the Ohio.

DIPHYPHYLLUM BREVE, *n. sp.*

Corallum simple, short, turbinate; posterior side straight, anterior curved, length respectively 8 and 10 mm.; calix 18 mm. in diameter, depth 4 mm., slightly oval, sides descending more or less abruptly; fossette prominent, situated anteriorly; number of lamellæ from 60 to 70, alternating in size, broad and rounded near the margin, becoming thinner as they approach the center; denticulations very prominent; transverse section of inclosed internal area oval, length 4 mm., width 3 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

DIPHYPHYLLUM TUMIDULUM, *n. sp.*

Corallum small, simple, increasing by calicular gemmation; length 15 mm. or less, from 3 to 4 mm. in diameter for about one-half the length, then quite abruptly expanding; diameter of the calix from 7 to 10 mm., depth 5 mm.; number of lamellæ 50, alternating in size; denticulations prominent; inclosed internal area 1 m. in diameter.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM, LONSDALE.

CYSTIPHYLLUM BIPARTITUM, *n. sp.*

Corallum simple, turbinate or sub-cylindrical, elongate; exterior with narrow, slightly elevated annulations and concentric striæ; external costæ obscure; calix oval, oblique, with a strong rounded elevation extending from the bottom to the anterior margin; somewhat coarse rudimentary rays converging to the ridge and bottom of calix and obscuring the cysts, which, near the margin, are small, becoming larger near the center; height of large specimen 100 mm.; diameter of calix 35 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM BIFURCATUM, *n. sp.*

Corallum simple, turbinate, regularly curved; exterior with frequent rounded annulations; when decorticated the internal costæ are distinct; calix nearly circular, oblique; fossette pyriform, situated posteriorly, a slight ridge marking its continuation on the anterior side of the calix; near the margin there are nine rudimentary lamellæ in the space of 5 mm.; as they approach the center two adjacent lamellæ usually coalesce, forming one larger one; cysts moderately large, obsolete in bottom of calix; height of corallum 70 mm., diameter of calix 30 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM MURICATUM, *n. sp.*

Corallum simple, turbinate, irregularly curved ; surface with annulations and numerous fine, concentric striæ, squamose in weathered specimens ; calix slightly oval ; fossette situated anteriorly ; cysts distinct near the margin, 1 m. in diameter, increasing in size toward the center ; bottom of the calix flat. There are fine rudimentary, crenulated lamellæ extending to the center and giving to the bottom of the calix the appearance of being covered with conical spinules ; height of corallum 50 mm.; length of calix 25 mm., width 20 mm.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM QUADRANGULARE, *n. sp.*

Corallum turbinate, small ; height 20 mm., diameter of calix 15 mm., depth 12 mm. ; fossette obscure ; rudimentary lamellæ coarse, rounded, 6 in the space of 5 mm.; a small space at the bottom of calix flat. The rudimentary lamellæ converge to the fossette and to three other lines, uniting and giving to the calix a quadrangular form.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM TENUIRADIUS, *n. sp.*

Corallum sub-cylindrical or elongate turbinate ; exterior with numerous annulations of growth, which on weathering present the appearance of a series of invaginated calices ; diameter of calix 35 mm., depth 20 mm., sides abrupt, a flat space at the bottom nearly 15 mm. in diameter ; number of lamellæ about 120, of uniform size, extending nearly to the flat area at the bottom of the calix, entirely obscuring the cysts. The cysts appear indistinctly on the bottom of the calix and on the decorticated exterior.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM NANUM, *n. sp.*

Corallum sub-cylindrical, straight or curved, very gradually expanding ; exterior with numerous irregular annulations and constrictions caused by intermittent growth ; height of corallum 40 mm.; diameter of calix 10 mm., depth 8 mm., sides nearly vertical, leaving a comparatively broad, nearly flat space at the bottom ; near the margin are fine rudimentary lamellæ becoming obsolete on the sides of the calix ; cysts at the center sometimes 4 mm. in diameter. This species is easily distinguished by its slender, elongate cylindrical form and its large cysts.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM LATIRADIUS, *n. sp.*

Corallum simple, turbinate, straight or slightly curved, rapidly expanding; exterior with gentle undulations and sharp constrictions; when decorticated it presents a very distinctly invaginated appearance; height of corallum 60 mm.; calix broadly bell-shaped, diameter 60 mm., depth 20 mm., a flat space at the bottom about 10 mm. in diameter occupied by large cysts; near the margin are broad, gently rounded rudimentary lamellæ of nearly uniform size, 6 or 7 in the space of 15 mm.; the cysts first appear at about 15 mm. from the margin, growing larger as they approach the center; the broad plications either end abruptly or are continued on the cysts as fine interrupted striæ. In a transverse section the corallum appears to be formed of thin, superimposed laminæ; in the manner of growth and appearance near the margin this species is very similar to a CHONOPHYLLUM.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM SUPRAPLANUM, *n. sp.*

Corallum simple, turbinate, proportional height and diameter varying in different individuals from 30 mm. in height and 30 mm. in diameter at the calix, to 20 mm. in height and 40 mm. in diameter, the corallum apparently consisting of thin, superimposed laminæ; calix superficial, 40 mm. in diameter, a flat, smooth space at the center of 6 mm. in diameter; the sides for a short distance abruptly ascending, then gently sloping to the margin; number of lamellæ 100 or more, about one-half of them extending a short distance upon the flattened space at the bottom of the calix. On the upper surface of the calix the cysts are obsolete or indistinct, but on the under surface of the laminæ they are frequently quite distinct.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM CRATERIFORME, *n. sp.*

Corallum simple, turbinate, straight or curved; height of an adult individual 70 mm., diameter of calix 50 mm., depth 40 mm.; on the anterior side, commencing at the center and continuing to the margin, are two slight depressions, distant from each other, at the margin, 40 mm., the space between them nearly flat; this feature in some individuals is very distinct, in others more obscure; no flattened space at the center of the calix, the sides regularly and abruptly sloping to the center; cysts small, from 1 to 3 mm. in diameter, most distinct near the margin and center; in other portions of the calix being obscured by the rudimentary lamellæ, which are continuous, closely arranged and vary in number from 100 to 150.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM PUSTULATUM, *n. sp.*

Corallum simple, turbinate, more or less rapidly expanding; proportional height and diameter varying; in some individuals of 35 mm. in height the diameter of the calix is 55 mm., in others, having a height of 80 mm., the diameter of the calix is 40 mm.; exterior comparatively smooth, with concentric wrinkles and striæ, and distinct external costæ; calix from 20 to 35 mm. in depth, for a short distance from the margin flat or gently curving, then abruptly and regularly sloping to the center; the entire surface of the calix shows prominent cysts from 1 to 3 mm. in diameter, increasing but little, if any, in size toward the center; occasionally a cyst occurs much larger than the ordinary ones; surface of the cysts marked by moderately coarse, interrupted striations. This species is apparently the only one from this locality in which the cysts are not more or less interrupted by the rudimentary lamellæ.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM INFUNDIBULUM, *n. sp.*

Corallum simple, elongate turbinate, usually straight: exterior comparatively smooth, with concentric wrinkles and striæ; external costæ distinct; height from 70 to 100 mm.; calix 50 mm. in diameter, depth 40 mm., margin thin, sides regularly sloping to the center. having the form of an inverted cone; except near the center the cysts are obsolete or greatly obscured by the rudimentary lamellæ, which are rounded, apparently nodulose, and about 100 in number; on the decorticated surface the cysts are very distinct. This species most closely resembles *C. crateriforme*, but the rudimentary lamellæ are much coarser, there being only thirteen in the space occupied by twenty-four in that species.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM OBLIQUUM, *n. sp.*

Corallum elongate turbinate, simple, height 70 mm.; calix shallow, very oblique, nearly parallel with the anterior side of the corallum, oval, length 30 mm., width 20 mm.; when the corallum is decorticated the lower margins of the successive calices have the appearance of crenulated tabulæ; rudimentary lamellæ six in the space of 10 mm., length 5 or 6 mm. from the margin: commencing at the center of the calix and continuing to the anterior margin is a rounded elevation, which for about 7 mm. is very prominent, thence gradually subsiding and becoming inconspicuous; from the center nearly to the posterior margin is a narrow depression; the posterior wall of the calix is nearly vertical, 4 mm. in depth, the other portions gently slope to the line along the middle.

Formation and locality. Corniferous limestone, Falls of the Ohio.

CYSTIPHYLLUM SCALATUM, *n. sp.*

Corallum simple, elongate, curved, sometimes tortuous; exterior with numerous concentric wrinkles and constrictions caused by intermittent growth; height of corallum 45 mm.; diameter of the calix 15 mm., depth 15 mm.; for a distance of 4 mm. from the margin of the calix the walls are thin and vertical, then for the space of 2 mm. flat, again vertical for the space of 3 mm., thence sloping to the bottom of the calix; a strong, rounded elevation extends from the center to the anterior margin; rudimentary lamellæ on the sloping portion of the calix strong, 1 m. in width, bifurcating as they approach the margin. The broad rudimentary lamellæ resemble those of CYSTIPHYLLUM, but the cysts, if they exist, are very obscure. In the shape of the calix it varies from any known species.

Formation and locality. Corniferous limestone, New York.

CYSTIPHYLLUM STRIATURA, *n. sp.*

Corallum simple, elongate turbinate, curved, acute at the base, regularly expanding to the calix; height 45 mm.; calix 15 mm. in diameter, depth 8 mm., regularly concave; fossette narrow, extending from the center to the anterior margin; a space at the center 5 mm. in diameter convex, nearly smooth; number of rudimentary lamellæ 30, of equal size, converging to the fossette and convex area at the center; no cysts visible in the calix; when decorticated the cysts ar very distinct on the exterior.

Formation and locality. Corniferous limestone, New York.

COLEOPHYLLUM, N. G.

Cyathophylloid corals, growing singly; the substance composed chiefly of a series of closely arranged, invaginated tabulæ, which are more or less oblique to the axis; rays obscure or obsolescent; calices oblique.

Owing to the partial development or incomplete continuity of the tabulæ, broad, shallow vesicles are sometimes formed.

COLEOPHYLLUM ROMINGERI, *n. sp.*

Corallum simple, straight, erect. Tabulæ extremely oblique, closely arranged, scarcely united along the posterior median line; rays fine, obscure, becoming obsolete toward the middle of the shallow calyx, and converging toward the posterior fossette. Base of attachment expanded.

The specimen figured is a straight, erect form, partially silicified and decorticated. The exterior had originally fine longitudinal striæ. In its present condition the posterior side is marked by a narrow slit or fissure, which is apparently due to a deep fossette on this side, and has become conspicuous by the removal of the epitheca.

Formation and locality.— Corniferous limestone, Falls of the Ohio.

COLEOPHYLLUM PYRIFORME, n. sp.

Corallum obliquely turbinate, curved, regularly enlarging from the apex; calyx of moderate depth, oblique, much shallower on the posterior side; the longitudinal lamellae closely arranged, and marked by a fossette on the posterior side, very fine, converging and [illegible] [illegible] like feathers, the rays on the posterior side having a [illegible] septal. Exterior marked by longitudinal striae and on the convex side by distinct annulations.

This species has a broad [illegible] form, with broad elliptical calyx. The specimens are silicified, and on that account the parts are not so clearly defined.

Formation and locality.—Corniferous limestone, Falls of the Ohio.

Other species of this genus are known in the Upper Helderberg limestones in the State of New York.

DESCRIPTIONS

OF THE SPECIES OF FOSSIL RETICULATE SPONGES, CONSTITUTING THE FAMILY DICTYOSPONGIDÆ.

By James Hall.

In 1882 the writer communicated to the American Association for the Advancement of Science, at its meeting in Montreal, some "Notes on the Family Dictyospongidæ," accompanied by lithographed plates from the 35th Report on the State Museum of Natural History, illustrating the genera CYATHOPHYCUS, DICTYOPHYTON, PHRAGMODICTYA, CLATHROSPONGIA. PHYSOSPONGIA, and showing their relations to UPHANTÆNIA. The paper was not communicated for publication; but an abstract, together with the plates and explanations, "subject to revision," was placed in the hands of the secretary for preservation.

The delay in printing the Museum Report has afforded an opportunity of acquiring material for a farther study and review of the characters and relations of the forms indicated in the original title. Several new species have been added, and some additional knowledge has been obtained regarding their habit of growth and mode of occurrence.

On account of the continued delay it has been deemed advisable to present the following abstract from the memoir on these fossils as already prepared for publication.

The structure of the frond, which characterizes every member of this family, may be described as a reticulation of tubular spicules, forming rectangular meshes. In the simpler forms these meshes alternate in size and strength, owing to the regular alternation in the size of the bundles of spicules, which determine the meshes. In the prismatic and nodose forms, certain bundles of spicules become very much developed, and produce the charactistic form and ornamentation of the cup. The middle layer is uniformly reticulate; while the inner and superficial layers show an oblique and sometimes a radiate arrangement of spicules. In the highly ornamented species, the outside layer of spicules is often produced into tufts, spines, and intersecting fimbria or laminæ, of greater or less prominence.

CHARACTERS OF THE GENERA.

CYATHOPHYCUS.

"Hollow membraneous fronds with an opening at the upper extremity of the frond, elongate or hemispherical in form; reticulate or plain structure."

DICTYOPHYTON.

Turbinate, cylindrical or prismatic forms which may be infundibuliform above, consisting of a reticulate envelope, externally marked by longitudinal and transverse striæ which divide the surface into minute rectangular spaces. Surface sometimes bullate or nodose from the abrupt expansion of the envelope.

ECTENODICTYA, *n. g.*

Discoid, globose, ovoid or irregularly expanding or explanate forms, consisting of a reticulate frond or envelope.

Several species referred to this genus are broadly spreading forms which are flattened, discoid or subovoid in form, sometimes apparently conforming to the sea-bottom and variously infolded or plicated. The reticulation is irregular, presenting radiating and concentric striæ which are frequently interrupted and altered in their direction.

LYRODICTYA, *n. g.*

Cyathiform fronds of a very fine reticulate tissue, composed of stellate spicules, with broad, strong, longitudinal bands of acicular spicules showing an alternating bifurcation.

THAMNODICTYA, *n. g.*

Fronds tubular below, rapidly expanding and cyathiform or infundibuliform above, with twelve strong longitudinal ridges dividing the surface into twelve areas. Substance reticulate, as in Dictyophyton.

This genus was originally included among the typical forms of Dictyophyton, but in the literature upon this subject the term has generally been applied to such forms as *D. tuberosum* and *D. Conradi*, and it would be unwise at the present time to restrict its application as originally proposed.

PHRAGMODICTYA, *n. g.*

Cylindrical or cup-shaped fronds, with a concave diaphragm near the broadly expanded base.

Substance composed of a reticulate tissue of six and three-radiate spicules and long cylindrical rods.

CLEODICTYA, *n. g.*

Frond rapidly expanding from the base to a subglobose or hemispherical form, bearing a row of large rounded nodes on the periphery; tube abruptly contracted above and extending in a cylindrical or slightly expanding form.

Substance composed of a regular lattice-work of six-radiate spicules, with bundles of larger acicular rods.

PHYSOSPONGIA, *n. g.*

Frond cylindrical or cyathiform, expanding from the base. Surface divided into from eight to twenty-four longitudinal areas by bands of tubular spicules, and into regular quadrules by concentric bands of spicules. The surfaces of these larger quadrules are alternately elevated and depressed, giving a bullate appearance to the cup. The spicules composing the bands are very elongate rods having an anchor-shaped extremity with the lateral processes much extended. Interzonate tissue finely reticulate. The spicules of the superficial layer have a radiate arrangement and are often produced into tufts or spines from the summits of the bullæ.

UPHANTÆNIA.

Circular fronds composed of ligulate radiating and concentric bands, with the inclosed large quadrules free from any tissue.

The bands show fine reticulate striæ similar to Dictyophyton. The margins of the ligulæ are thickened, probably from the aggregation of spicules.

DESCRIPTION OF SPECIES.

CYATHOPHYCUS RETICULATUS.

Plate 18, Fig. 1.

Cyathophycus reticulatus, WALCOTT. Trans. Albany Inst., x, p. 18, pl. 2, figs. 16 a-d. 1879.

Cup elongate turbinate, hollow; length about three times the diameter; gradually enlarging from the initial point to near the summit, whence the tube is gradually contracted to the aperture. Base attenuate.

Structure reticulate. Surface usually entire, sometimes showing a low elevation of the surface or an obscure node in each large quadrule.

An ordinary specimen has a length of 95 mm., with a diameter of 28 mm. in its compressed condition.

Formation and locality. In the Utica slate; Holland Patent, Oneida county, N. Y.

CYATHOPHYCUS SUBSPHERICUS.

Cyathophycus subsphericus, WALCOTT. Trans. Albany Inst., vol. x, p. 19, pl. 2, fig. 17. 1879.

The original description of this species is as follows: "Hollow membraneous fronds with a circular opening at the apex of a nearly hemispheric body."

"This species is less firm in structure than the preceding, there being no thickening of the cell walls to give the reticulated appearance and to preserve the form, which varies from circular to oval, as if a hemispheric body had been pressed flat. In an example three centimetres in diameter; the circular opening is nine millimetres in diameter."

Formation and locality. Utica slate; town of Trenton, Oneida county, N. Y.

DICTYOPHYTON HAMILTONENSE, *n. sp.*

Cup broadly cyathiform, expanding rapidly from an obtuse base; length and breadth, in the specimen as preserved, about equal. Base broad and irregularly nodose with fascicles of spicules extending downward, forming media for attachment.

Surface very coarsely reticulate with strong nodose radiating and concentric elevated ridges. Intermediate spaces very finely reticulate, and ornamented by irregular nodes or nodose ridges.

The specimen, which is imperfect in the upper part, has a length of 95 mm., with an equal diameter in its compressed state.

Formation and locality. In the shales of the Hamilton group; shore of Canandaigua lake, N. Y.

DICTYOPHYTON PATULUM, *n. sp.*

Upper part of the frond spreading, widely infundibuliform.

Surface marked by strong radii with slight elevations of the substance, indicating a division into, probably, eight areas. Intermediate spaces reticulated with radii and transverse lines of alternating degrees of strength.

The specimen described has a height of about 63 mm., and a breadth at the top of 130 mm., at the base a greatest diameter of 60 mm. and a smallest diameter of 35 mm. The ovate form of the transverse section is due to compression. The original extent of the lower portion of the frond is unknown.

Formation and locality. In a sandstone of the Chemung group; Cohocton, Steuben county, N. Y.

DICTYOPHYTON FENESTRATUM.

Dictyophyton fenestratum, HALL. Sixteenth Rept. State Cab. Nat. Hist., p. 90, pl. 3, fig. 4. 1863.

Cup robust cylindrical, elongate. Base unknown.

Surface strongly reticulate, and with gentle undulating annulations.

The fragment described has a length of 95 mm., and a greatest width of 47 mm.

Formation and locality. In the Chemung group; Chemung Narrows. N. Y.

DICTYOPHYTON RUDE.

Dictyophyton rude, HALL. Sixteenth Rept. State Cab. Nat. Hist., p. 90, pl. 5, fig. 3. 1863.

Cup cylindrical, with coarse elevated cancellating ridges and intermediate longitudinal and transverse fine striæ.

The fragment has a length of 138 mm., and a diameter in its compressed condition of 63 mm.

It is very remarkable for the great prominence of the stronger striæ, and the nodose character developed at their intersection.

Formation and locality. In the Chemung group; Little Genesee, Alleghany county, N. Y.

DICTYOPHYTON PRISMATICUM, *n. sp*

Plate 18, Fig. 2.

Cup extremely elongate, narrow, somewhat regularly octagonal, prismatic; straight or slightly curved. Tube a little flattened laterally, and giving an octagonal section having a shorter diameter from two-thirds to four-fifths of the longitudinal diameter. Base attenuate, very gradually expanding.

Surface cancellated by longitudinal and concentric striæ which are regularly alternating in three degrees of strength, and with the intermediate spaces finely reticulated. The angles of the prism show an expansion or fimbria extending one or two mm. beyond the tube.

A small specimen has a length of 95 mm., the smallest diameter at the top is 18 mm and the largest diameter is 24 mm. A larger specimen has a length of 160 mm., and a diameter of 16 mm. at the base, and 26 mm, at the larger end.

Formation and localities. In the upper part of the Chemung group: numerous specimens have been found near Concord station, Erie county, and Warren, Pa.

DICTYOPHYTON TELUM, *n. sp.*

Cup prismatic, small, rapidly enlarging from the base for about one-third of its length, thence gradually attenuating toward the aperture, with four scarcely perceptible undulations, transverse section octagonal. Base essentially entire, showing a small cicatrice for attachment. Aperture slightly contracted.

Surface finely reticulate, with a single stronger striation along the middle of each face. Angles well-defined, marked at distant intervals by low scarcely defined nodes which indicate the intersection of stronger transverse striæ, giving the appearance of very slight annulations to the prism.

A small entire specimen has a length of 65 mm., a greatest diameter of 15 mm. and a transverse diameter of 12 mm.

Formation and locality. In the shaly sandstone of the Chemung group; Cattaraugus county, N. Y.

DICTYOPHYTON FILITEXTILE.

Dictyophyton filitextile, HALL. Sixteenth Rept. State Cab. Nat. Hist., p. 88, pl. 4, fig. 5. 1863.

Cup cylindrical, tubular, very gradually enlarging from the base upward.

The striæ are sharp, linear, and in three degrees of prominence. In the longitudinal direction there is a very slight angularity, or greater prominence, at regular intervals of every eighth striation.

The fragment has a length of 65 mm. and a greatest width of 16 mm.

Formation and locality. In a shaly sandstone of the Chemung group; Steuben county, N. Y.

DICTYOPHYTON IRREGULARE, *n. sp.*

Cup turbinate, cylindrical.

Surface coarsely cancellate by transverse and radiating striæ, with some remains of several transverse, stronger nodose striæ which produce gentle undulations in the tube. The finer reticulating striæ, if ever existing, have been removed by maceration.

The specimen has a length of 70 mm., and the two diameters of the compressed specimen are 13 and 25 mm. respectively.

Formation and locality. In the Chemung group; Ithaca, N. Y.

DICTYOPHYTON BACULUM, *n. sp.*

Cup prismatic, distinctly octagonal, the side being flat or slightly concave, attenuate toward the base; very gradually enlarging from the base to a point above the middle, above which the tube is more rapidly expanding. Base unknown.

Surface marked by strong longitudinal and transverse striæ, between which are other striæ of two degrees of strength, which separate the surface into quadrules of finer reticulations.

The specimen described, which is imperfect below, has a length of 150 mm., and it has probably been more than 200 mm. in length in its original condition. At the lower part of the specimen as preserved, it measures in its two diameters 22 and 30 mm. respectively. Its greatest diameter in the upper part is 44 mm.

Formation and locality. In the sandstone of the Chemung group; found loose at Wellsville, Alleghany county, N. Y.

DICTYOPHYTON PARALELLUM, *n. sp.*

Cup prismatic, very gradually enlarging, octagonal in transverse section, but with the angles subdued; intermediate spaces slightly convex. Base unknown.

Surface finely reticulate.

The specimen is an impression of the exterior in argillaceous sandstone, having a length of 130 mm., and the divergence of the angles limiting the sides is less than one mm.

Formation and locality. In the Chemung group; precise locality unknown.

DICTYOPHYTON CONRADI.

Plate 18, Figs. 3, 4, 4a.

Dictyophyton Conradi, HALL. Sixteenth Ann. Rept. State Cab. Nat. Hist., p. 89, pl. 5, fig. 2; pl. 5 a., fig. 2. 1863.

Cup subturbinate, slightly curved, flattened; transverse section octagonal, having the proportions of about as two to three, and in the upper part where compressed, about as three to eight. Base attenuate, somewhat rapidly expanding above, increasing from 12 mm. near the base to 45 mm. near the summit in the distance of 210 mm.

The upper part of the tube as preserved, is marked by strong protuberances produced by the depression and elevation of the surface between the angles. Entire surface reticulate by longitudinal and transverse striæ. There is a stronger striation along the middle of each face.

The length of the specimen described, which is the only one yet observed, and is imperfect in the upper part, is 130 mm., with a greatest diameter in the upper part of 45 mm.

Formation and locality. In the Chemung group; Randolph, Cattaraugus county, N. Y.

DICTYOPHYTON ANNULATUM.

Plate 18, Fig. 5.

Dictyophyton annulatum, HALL. Sixteenth Rept. State Cab. Nat. Hist., p. 90, pl. 3, fig. 3. 1863.

Cup cylindrical, annulated, without nodes, and having a finely reticulate surface.

The fragment has a length of 60 mm., with a diameter of 16–18 mm. between the annulations.

Formation and locality. Chemung group; western part of New York.

DICTYOPHYTON CINCTUM, *n. sp.*

Cup elongate, turbinate or subcylindrical. Base unknown.

Surface very finely reticulated, with the distinction between the finer and coarser striæ very subordinate. Tube strongly annulated: annulations abrupt, subequidistant. The depressions are about equal in width to the annulations. There are six annulations in the length of 85 mm. on one side of a large specimen, and upon the other side there are four annulations in the length of 65 mm.

The entire dimensions of the cup are unknown. A fragment much compressed, and preserving a length of 110 mm., has a width of 120 mm. in its compressed condition, and shows very little diminution in the diameter of the tube in the length of the fragment. A small specimen in the same association has a length of 53 mm., with a diameter at the larger end of 12 mm., and at the base, which is imperfect, of 7 mm. The tube shows eight annulations; the five upper ones being somewhat flattened and with a depression along their summits, showing a tendency to duplication. In the depressions between the annulations there is a stronger concentric striation.

Formation and locality. In a sandstone of the Chemung group; from a boulder at Erie, Pa.

DICTYOPHYTON NODOSUM.

Plate 18, Fig. 6.

Dictyophyton nodosum, HALL. Sixteenth Ann. Rept. State Cab. Nat. Hist., p. 91, pl. 3, fig. 2. 1863.

Cup prismatic, very gradually enlarging above. Base unknown.

Surface somewhat strongly reticulate; angles bearing strong rounded nodes.

The fragment has a length of 60 mm., the distance between the rows of nodes is 12 mm.

It differs from *D. tuberosum* in having the longitudinal rows of nodes more nearly parallel, smaller, and more closely arranged in rows while they are not angular.

Formation and locality. In an argillaceous sandstone of the Chemung group; Steuben county, N. Y.

DICTYOPHYTON TUBEROSUM.

Plate 18, Figs. 7, 8.

Hydnoceras tuberosum, CONRAD. Jour. Nat. Sci. Phil., vol. viii, p. 267, pl. 16, fig. 1. 1842.

Dictyophyton tuberosum (CONRAD), HALL. Sixteenth Rept. State Cab. Nat. Hist., p. 90, pl. 3, fig. 1. 1863.

Not *Dictyophyton tuberosum* (CONRAD), BARROIS. Memoire sur les Dictyospongidæ; Ex. des Ann. de la Soc. Geol. du Nord, t. xi, p. 82, pl. 1, fig. 1. 1883.

Cup turbinate, elongate, more or less expanded above, attenuate below.

Surface ornamented by strong elevated nodes, which are arranged in regular order longitudinally and transversely. The transverse ranges are in four pairs, making eight nodes in the circumference. The intermediate spaces are concave and the interval between each row is also broadly concave. The nodes are themselves elongate-conical, often becoming compressed and subcuneate at the extremity. Entire surface reticulate with longitudinal and transverse striæ which are continued over the nodes. In well-preserved specimens the fascicles in the line of the nodes are extended into longitudinal elevated lamellæ, which are produced into spiniform extensions of the crests of the nodes.

Specimens vary in length from 150 to 250 mm., and in diameter at the largest end from 25 to 130 mm. or more.

Formation and localities. In the upper part of the Chemung group; in Howard, Addison and Cohocton, Steuben county, N. Y.

DICTYOPHYTON SACCULUM, *n. sp.*

Dictyophyton Redfieldi? HALL. Sixteenth Rept. State Cab. Nat. Hist., pl. 4, fig. 6. 1863.

Cup cylindrical, short; length once and a half the width in a compressed specimen.

Surface coarsely reticulate, without nodes, the larger striæ not being very conspicuous.

The compressed specimen has a length of 33 mm. and a width in the middle of 20 mm.

In the original publication this species was referred with doubt to *D. Redfieldi*, but a critical examination shows it to be entirely distinct. The specimen is probably incomplete.

Formation and locality. In the micaceous sandstones of the Waverly group; Richfield, Ohio.

DICTYOPHYTON TENUE.

Plate 19, Fig. 5.

Dictyophyton tenue, HALL. Notes on the Family Dictyospongidæ; prelim. for the 35th Rept. N. Y. State Museum Nat. Hist., pl. 18, fig. 5. 1882.

Cup apparently broadly funnel-shaped; entire form and proportions unknown. Base narrow.

Surface marked by strong vertical and concentric striæ which are comparatively approximate; the intermediate spaces very finely reticulate. The frond is ornamented by broad rounded nodes, produced by the abrupt swelling of the surface.

The fragment described is about 45 mm. long and 30 mm. wide.

Formation and locality. In the Waverly group; Warren, Pa.

DICTYOPHYTON (CLATHROSPONGIA) ABACUS.

Plate 19, Figs. 2-4.

Clathrospongia abacus, HALL. Notes on the Family Dictyospongidæ; prelim. for the 35th Rept. Pl. 19, figs. 2-4. 1882.

Cup turbinate, length a little more than twice the greatest diameter. Base narrow and attenuate.

Surface marked by vertical and transverse alate expansions, which extend beyond the body for a distance of about eight mm., intersecting each other at right angles, and presenting a deeply fenestrate aspect. The entire surface, both of the body and expansions, is finely reticulate. When the alations are removed, or broken away, their bases leave strong vertical and transverse ridges. There are twelve radiating ridges in the entire circumference of the cup.

An imperfect specimen has a length of 100 mm. and a diameter of about 45 mm. at the larger end.

Formation and locality. In the sandstone of the Waverly group; Warren, Pa.

DICTYOPHYTON (?) REDFIELDI.

Plate 18, Fig. 9.

Dictyophyton Redfieldi, HALL. Sixteenth Rept. State Cab. Nat. Hist., p. 88, pl. 5, fig. 1, and pl. 5a, fig. 1. 1863.

Cup subcylindrical, broader below, gently contracting to a point above the middle of its height, thence abruptly enlarging to a broad flabellate or infundibuliform expansion. Base broader than the body above.

Surface cancellated by almost equal, strong, thread-like striæ, with the intermediate spaces finely reticulate.

The specimen is imperfect at both extremities, and somewhat compressed. The length preserved is 200 mm., the width at base more than 80 mm. In the middle of its length it has a width of 40 mm., and the greatest breadth above is 105 mm.

Formation and localities. In the Waverly sandstone; Harrisville and Akron, Ohio.

DICTYOPHYTON CYLINDRICUM.

Dictyophyton cyclindricum, WHITFIELD. Bulletin No. 1, Am. Mus. Nat. Hist., p. 19, pl. 4, fig. 3. 1881.

The specimen described in the Bulletin of the American Museum of Natural History is apparently a portion of a flattened cylindrical tube, showing very fine surface reticulations, in which the stronger striæ are not preëminently conspicuous, but sufficiently so to divide the surface into quadrules of finer reticulations. The coarse transverse and longitudinal rod-like spicules are shown in the specimen, but they do not afford any specific characters under the microscope. The fragment is incomplete at both extremities, having a length of 65 mm. and a width in its compressed condition of 57 mm. In its surface markings the specimen bears no very close resemblance to any other known species.

Formation and locality. In the shales of the Keokuk group; Crawfordsville, Indiana.

ECTENODICTYA IMPLEXA.

Plate 19, Fig. 1.

Dictyophyton implexum, HALL. Notes on the Family Dictyospongidæ; prelim. to the 35th Rept. pl. 18, fig. 1. 1882.

Frond a reticulate expansion, assuming a variety of form from pressure or other causes; the original form has been apparently broadly funnel-shaped or ovoid. Base unknown.

Surface cancellate by strong concentric and vertical striæ; the intermediate spaces finely reticulate by filiform striæ, which cross each other rectangularly. The body presents prominences, or protuberances, which are not sufficiently elevated to be termed nodes.

A large imperfect specimen, which is distorted by compression, has a length of 180 mm. and a width of about 93 mm.

The specimens of this species are all more or less distorted; they appear as broad funnel-shaped expansions without evidence of a distinct tubular base, and are usually fragmentary.

Formation and localities. In sandstones of the Waverly group, at Warren and Oil City, Pa.

ECTENODICTYA EXPANSA.

Plate 20, Fig. 10.

Phragmodictya ? expansa, HALL. Notes on the Family Dictyospongidæ; prelim. for the 35th Rept., pl. 19, fig. 10. 1883.

Frond explanate, discoid or flabelliform. Base unknown.

Surface closely reticulated by strong radiating and concentric striæ, which are somewhat irregular in their arrangement. Margin plicate or subnodose. The disc is likewise marked by distant stronger striæ dividing the surface into larger quadrules, but their regular recurrence cannot be determined over the entire surface. The specimen preserves but a single surface, and is a part of a subcircular discoid form lying upon the nearly plane surface of the matrix, and parallel to the lines of bedding, as shown by the ripple-marks upon the opposite side.

The fragment described has a diameter of 145 mm.

Formation and locality. In sandstone of the Waverly group, at Warren, Pa.

ECTENODICTYA BURLINGTONENSIS, *n. sp.*

Frond flabellate or explanate.

Surface reticulate by radiating and concentric striæ. The concentric striæ are nearly equidistant, about two in the space of three mm. The radiating striæ are somewhat more distant; between each pair of these are quadrules of finer reticulations. The radiating striæ are sometimes fasciculate and irregular, the fascicles dispersing and their individuality lost toward the outer margin.

The fragment described has a length of about 150 mm., the greatest width at the outer extremity is about 120 mm.

Formation and locality. In the yellow sandstones below the limestone, at Burlington, Iowa.

ECTENODICTYA ECCENTRICA.

Plate 20, Fig. 1.

Phragmodictya eccentrica, HALL. Notes on the Family Dictyospongidæ; prelim. for the 35th Rept., pl. 19, fig. 1. 1882.

Discoid, with the margins incurved; or forming shallow saucer-shaped fronds.

Surface marked by radiating and concentric striæ, with the intermediate spaces finely reticulate. Toward the periphery the surface shows undulations, with a tendency to plication.

A small specimen has a diameter of about 85 mm.

Formation and locality. In the calcareous shales of the Keokuk group; Crawfordsville, Ind.

LYRODICTYA ROMINGERI, *n. sp.*

Cup infundibuliform or flabelliform; entire frond unknown.

Surface reticulate by strong radiating and concentric striæ, which are subequidistant and closely arranged, dividing the entire surface into smaller quadrules of finer reticulations. The surface is also divided into longitudinal areas about 15 mm. in width, limited by strong radiating bands of spicules.

A compressed specimen has a length of 95 mm. and a width at the base of 55 mm.; at the outer margin near the aperture it is 100 mm. measured between the same bands of spicules.

Formation and locality. In the calcareous shale of the Lower Carboniferous group; Crawfordsville, Ind.

THAMNODICTYA NEWBERRYI.

Plate 18, Figs. 10, 11.

Dictyophyton Newberryi, HALL. Sixteenth Rept. on the N. Y. State Cab. of Nat. Hist., p. 87, pl. 4, figs. 1–3. 1863.

Frond abruptly attenuate near the base, cylindrical above, becoming infundibuliform toward the aperture.

Surface strongly marked with radiating and concentric striæ; the stronger ones in both directions nearly equidistant, except near the intercalation of a radiating band, between these striæ are quadrules of finer reticulations.

In a well-preserved specimen there is a series of more distant and stronger radiating and concentric striæ, which are nodose at their junction. The radiating striæ divide the surface into twelve subequal areas; which features prevail both upon the pedicel and the expanded frond.

A separated pedicel has a length of 150 mm., and in its compressed condition it has a longer diameter near the base of 46 mm., with a shorter diameter of 15 mm. At the upper portion, where it begins to expand, it has a longer diameter of 65 mm., and a shorter diameter of 16 mm. A small specimen shows a portion of the pedicel about 40 mm. long, with the infundibuliform expansion of about 50 mm. in length. The diameter of this portion in its flattened condition is about 100 mm.

Formation and localities. In the shaly and laminated sandstone of the Waverly group; at Cuyahoga Falls, and in more shaly beds at Richfield, Ohio.

PHRAGMODICTYA CATILLIFORMIS.

Plate 18, Figs. 12–14; Pl. 20, Figs. 2, 3; Pl. 21, Figs. 1-6.

Dictyophyton catilliforme, WHITFIELD. Bulletin No. 1, Am. Mus. Nat. Hist., p. 18, pl. 3, fig. 1. 1881.

Phragmodictya scyphus, HALL. Notes on the Family Dictyospongidæ; prelim. for the 35th Rept., pl. 17, figs. 12, 13; pl. 19, figs. 2, 3; pl. 10, figs. 1–6. 1882.

Cup subcylindrical, or more or less gradually or rapidly expanding to near the aperture. Walls of the cup supported by a strong transverse septum and surrounded by an irregular plicate expansion of the substance of the tube. Frond composed of finely reticulate tissue.

Surface ornamented by elongate nodes and ridges. The expansion from the base is sometimes regularly plicate and the margin scolloped, showing the same reticulate tissue that pervades the entire frond. The septum is concavo-convex and composed of fine reticulate tissue with stronger radiating striæ.

The dimensions are extremely variable. A small cylindrical specimen, somewhat compressed, with a length of 90 mm., has a diameter near the top of 30 mm., and within one-fourth of its length from the upper extremity the diameter is 33. A compressed specimen of medium size has a height of 100 mm., a diameter at the diaphragm of 65 mm. and at the other extremity 78 mm.

The largest specimen seen is obliquely compressed, has a diameter at the septum of 135 mm., and at the top (which is incomplete at the margin) the width is over 200 mm. The smallest diaphragm measures about 16 mm., and there are many between this size and 100 mm. The largest diaphragm measures 125 mm. in its greatest diameter, and 95 mm. in the transverse diameter, and the same specimen, including the expanded border, measures in its greatest diameter 185 mm., and in its transverse diameter 150 mm.

Formation and locality. In the shales of the Keokuk group; Crawfordsville, Ind.

PHRAGMODICTYA LINEATA.

Plate 21, Fig. 8.

Phragmodictya lineata, HALL. Notes on the Family Dictyospongidæ: prelim. for the 35th Rept., pl. 20, fig. 8. 1882.

The specimen is a flattened cylindrical body, having a length about three times its width. One extremity is truncated by a convex septum with a strong excentric cicatrice.

Surface rather coarsely reticulate, the longitudinal and transverse striæ being of nearly equal strength, and nodose at their intersection.

The length of the fragment is 65 mm., width across the septum 25 mm., width in the middle of its length about 20 mm.

This species differs from *P. catilliformis* in its much smaller size, more convex septum, stronger reticulating striæ and absence of nodes or ridges.

Formation and locality. Keokuk group; Crawfordsville, Ind.

PHRAGMODICTYA PATELLIFORMIS, *n. sp.*

The specimen described is a septum of a species of this genus, preserving some small portions of the cylindrical body or cup. Form ovate, patelliform; apex excentric; longitudinal diameter one-seventh greater than the transverse diameter.

Surface radiatingly striate from the apex; striæ increasing in number and strength as they approach the margin. Fine radiating and concentric striæ reticulate the surface; with stronger radii composed of fascicles of finer striæ, which become nodose toward the periphery.

The greatest length of the septum is 135 mm. and the greatest width is 115 mm. The length from the cicatrice to the distal margin is 100 mm., the transverse diameter through the apex is 100 mm.

Formation and locality. In the calcareous shales of the Keokuk group; Crawfordsville, Ind.

CLEODICTYA GLORIOSA, *n. sp.*

Frond large, urn-shaped, rotund below and tapering toward the base, ventricose above, and the prominent portion of the periphery ornamented by large rounded nodes. Frond contracting abruptly above the nodes and continuing in a subcylindrical form, which gradually expands above. Entire form unknown.

Frond composed of reticulate tissue. The stronger vertical and transverse striæ are somewhat irregularly disposed, owing to the inequality of the surface, but including between them quadrules of finer tissue.

A large imperfect frond has a height of 200 mm., a greatest diameter measuring across the nodose periphery of 220 mm., the transverse diameter in the same plane is about 135 mm., the difference being due to compression. At the constriction above the nodes the diameters are respectively 70 and 130 mm. The transverse section was originally circular. A section of a smaller specimen, or of a continuation of the tube at a higher point, is nearly circular, having one diameter 110 mm. and the other 115 mm., to the periphery formed by the nodes, while the continuation of the tube above measures 65 mm. by 70 mm.

This is a most remarkable species, varying, both in its general form and magnitude, and in the development of its twelve peripheral nodes, from any known form of this family.

Formation and locality. In a sandstone which comes above the shaly beds, at Crawfordsville, Ind., of the age of the Lower Carboniferous limestones.

CLEODICTYA ? MOHRI, *n. sp.*

Cup ventricose below, cylindrical and gently contracted in the middle, somewhat spreading toward the aperture ; length more than twice the diameter through the middle of its extent. Base unknown.

Surface finely reticulate, with stronger longitudinal and transverse striæ at intervals of three to five mm. The inflated portion below the middle presents several broad low bullæ.

The specimen described, which is imperfect at both extremities, has a length of 140 mm., the diameter in the middle of its length is 65 mm., the diameter in the ventricose portion is nearly 100 mm., and at the other extremity about 75 mm.

Formation and locality. In the calcareous shale of the age of the Keokuk limestone ; Crawfordsville, Ind.

PHYSOSPONGIA DAWSONI.

Plate 20, Figs. 4-6, 8.

Uphantænia Dawsoni, WHITFIELD. Bull. No. 1, Am. Mus. Nat. Hist., p. 15, pl. 4, figs. 1, 2. 1881.
Uphantænia Dawsoni, WHITFIELD. Am. Jour. Sci., August, 1881.
Physospongia Dawsoni (WHITFIELD), HALL. Notes on the Family Dictyospongidæ ; prelim. for the 35th Rept., pl. 19, figs. 4-8. 1882.

Cup subcylindrical or gradually expanding above. The entire form is unknown. Base unknown.

The frond consists of a continuous minutely reticulated tissue, which is divided into longitudinal and transverse areas by bands of acicular spicules. In a longitudinal direction there are twenty-four bands, of two dimensions; the smaller ones corresponding in strength with the transverse bands. The tissue occupying these twenty-four rows of quadrules is alternately depressed and elevated, giving a low nodose or bullate aspect to the surface. The tubercles show a radiating arrangement of the spicules, and the superficial layer is often extended from the summit into spiniform processes.

The specimens obtained are fragmentary, of lengths varying from 50 to 80 mm., and widths from 40 to 70 mm. A single cylindrical, flattened specimen has a length of 70 mm., and diameters of 40 and 30 mm. respectively.

In the removal of these specimens from the matrix, the nodes are frequently broken off, giving the appearance of a coarsely fenestrate frond, and this condition has led to its identification with UPHANTÆNIA; but it is only in this broken state that it bears any resemblance to that genus. The surface, when entirely preserved, consists of a continuous reticulate tissue, a character never existing in UPHANTÆNIA.

Formation and locality. In the shales of the Keokuk group: Crawfordsville, Indiana.

PHYSOSPONGIA COLLETTI, *n. sp.*

Plate 20, Fig. 7.

Frond cyathiform, more or less rapidly expanding above. Entire form unknown. Base unknown, but probably abruptly attenuate.

Substance composed of a very finely reticulate continuous tissue.

Surface divided into eight distinct areas by strong radiating ridges composed of bundles of spicules. These areas are longitudinally divided, each into two smaller fields, by a finer longitudinal band. The entire surface is traversed by transverse bands which, with the radiating bands, divide it into small quadrules, which are alternately elevated and depressed, giving the surface a bullate appearance. These quadrules are wider than high. The principal radiating bands are strong and regular. The transverse bands are regular and of uniform size; and the intermediate smaller radiating bands are irregular, sometimes giving rise to three or four bullæ and corresponding depressions between the main radii, while the normal number seems to be two.

The dimensions of the principal specimen described are as follows: Vertical height, 85 mm.; transverse diameter at the lower margin of the specimen, which is compressed, 85 mm.; the transverse diameter at the upper margin is 150 mm. Fragments of much larger individuals have been observed.

Formation and locality. In the shales of the Keokuk group; Crawfordsville, Ind.

PHYSOSPONGIA ALTERNATA.

Plate 20, Fig. 9.

Physospongia alternata, HALL. Notes on the Family Dictyospongidæ; prelim. for the 35th Rept., pl. 19, fig. 9. 1882.

Cup cylindrical. Proportions of length and breadth unknown. Base unknown.

Substance consisting of closely reticulated tissue, with stronger longitudinal and transverse bands of spicules, which divide it into twelve longitudinal rows of quadrules; these are alternately elevated and depressed.

The fragment described has a length of about 45 mm.; in its compressed condition it has a greatest width of 25 mm., and the shortest diameter is 10 mm.

Formation and locality. In the shales of the Keokuk group; Crawfordsville, Ind.

UPHANTÆNIA CHEMUNGENSIS.

Uphantænia Chemungensis, VANUXEM. Rept. 3d Geol. Dist. N. Y., p. 183, fig. 50. 1842.

Uphantænia Chemungensis (VANUXEM), HALL. Sixteenth Rept. State Cab., p. 86. 1863.

Not *Uphantænia Chemungensis* (VANUXEM), DAWSON. Quarterly Jour. Geol. Soc. London. 1862.

Frond circular or subcircular, gently convex on the lower side, with a depression in the middle; consisting of continuous bands radiating from a central point or defined central area, increasing in width as they recede from the center, and arranged at subequal distances from each other. The entire number of these radiating bands is thirty-two, every fourth one being stronger than the intermediate ones. These radiating bands are crossed concentrically, but not intersected, by another set of bands which are of equal width throughout their extent, each successive one being a little wider than the preceding, until the frond is completed. The interstices between these bands are entirely free from any substance in the original frond, and as preserved in the rock, the interspaces are filled with the substance of the matrix.

The surface of the frond, both in the radiating and concentric bands, is similar, and shows evidence of fine striations, and was, doubtless, finely reticulate. Where these bands cross each other, there is no proper intergrowth, but a double thickness of the tissue is observable, while each band maintains its independent growth and limitation.

The original specimen, from center to circumference, has an extent of 155 mm.; across the greatest width, at right angles to this, it measures 140 mm. The largest specimen known has a greatest diameter of nearly 350 mm., the semi-diameter on the most extended side is 190 mm.

Formation and locality. In the fine grained sandstone of the upper Chemung group; near Owego, N. Y.

ADDENDA ET CORRIGENDA.

Page 430. The species described as *Zaphrentis inequalis* may be stricken out. Subsequent examination of the specimen described has shown that it belongs to the Hudson River Group, and is the *Palæophyllum divaricans* of Nicholson.

Page 438. *Zaphrentis inclinata* is equivalent to *Cyathophyllum agustatum*. The specimen is from the Niagara Group of Kentucky.

Page 407. Only eight plates are here given to accompany the paper on the Fossil Corals. It is intended, at a future date, to republish this paper with illustrations of all the species.

Page 465. It was originally intended to publish the complete memoir on the Fossil Reticulate Sponges; but the exigencies of publication have necessitated the presentation of the present abstract. As soon as the drawings and lithography can be completed, the entire memoir will be published as a bulletin of the State Museum.

The document edition of seven hundred copies of the Thirty-fifth Report of the State Museum, has been issued without the seven pages properly following p. 406 and marked 406,[a] etc., though the whole was in type at the time. The plates, 3–13, in the same volume, were printed without the knowledge of the author or the Director of the Museum, no proofs having been submitted to either of them.

ERRATA.

Page 409, line 3, for exstans read extans.
Page 414, line 6, for cristulatum read cristulata.
Page 414, line 3 from bottom, for subvesiculare read subvesicularis.
Page 429, line 15, for trisculactum read trisulcatum.
Page 337, line 10, for anterior read posterior.
Page 352, line 13, after elongate insert straight or slightly curved.

FIG. 1.

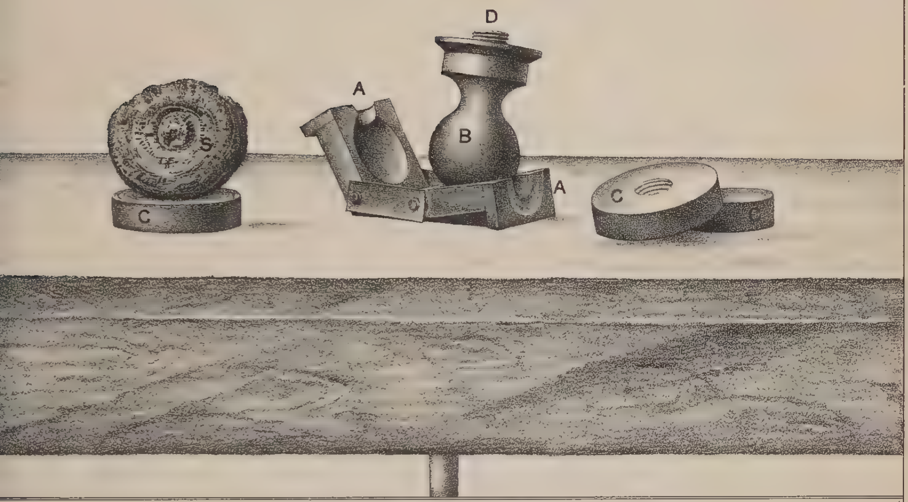
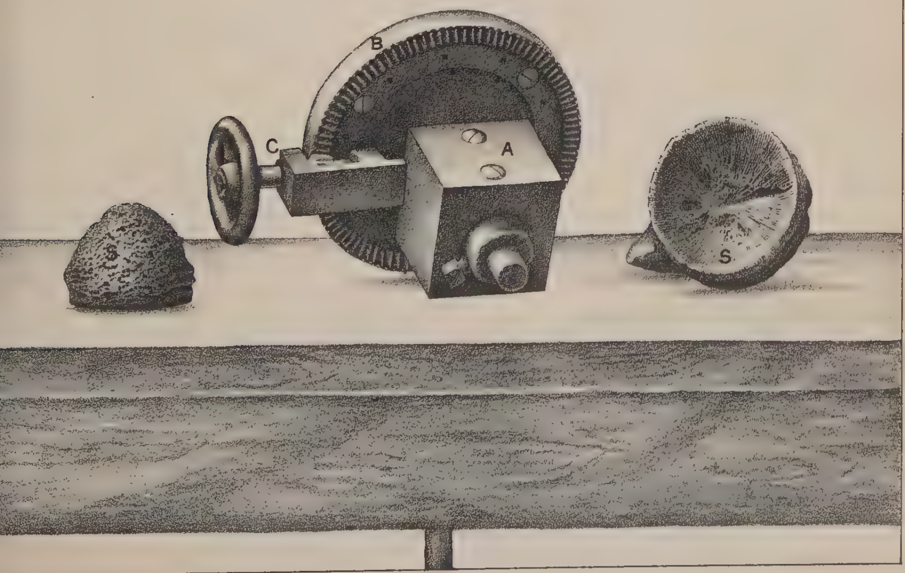
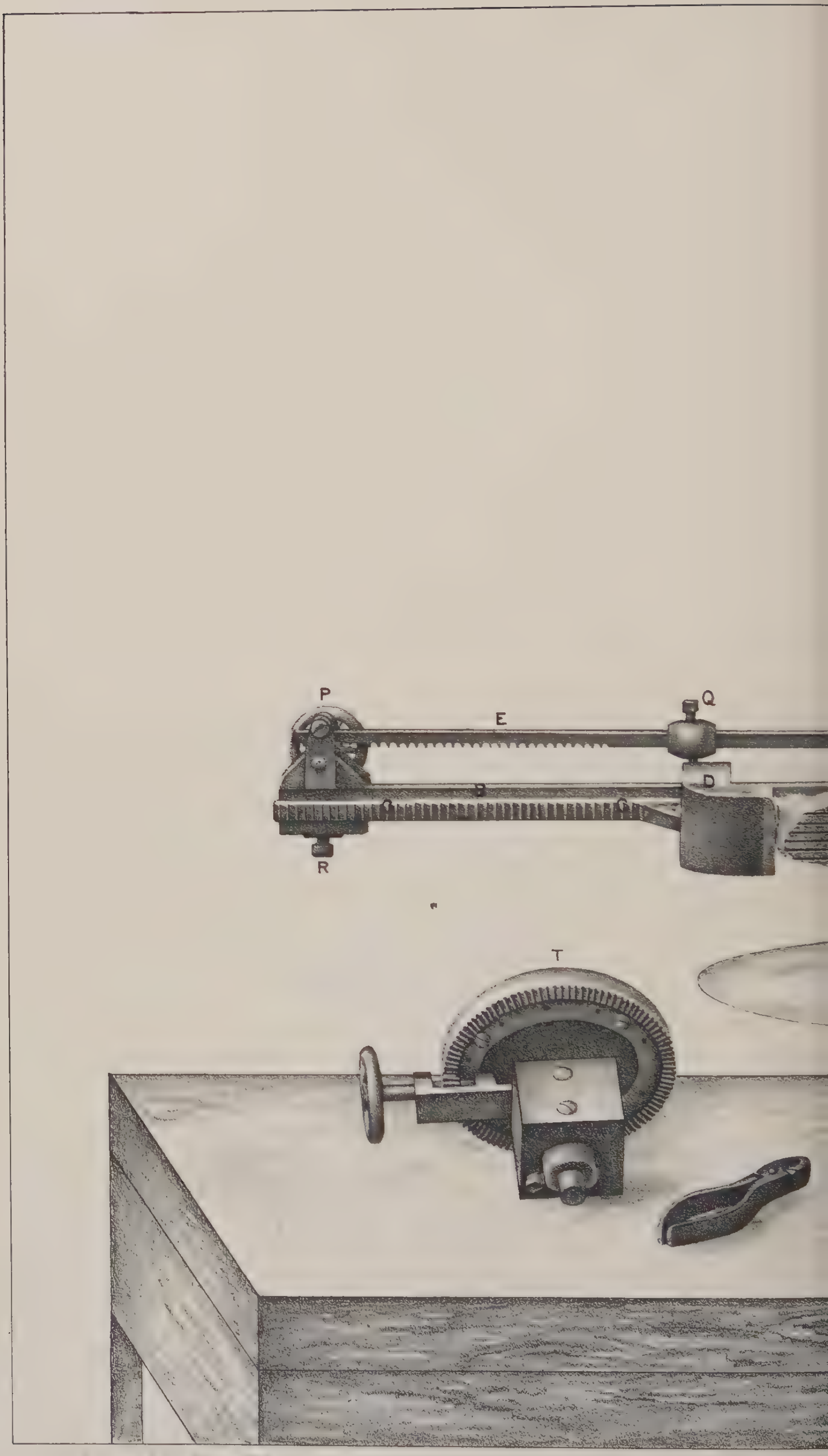


FIG. 2.



Weed, Parsons & Co Albany, N.Y.



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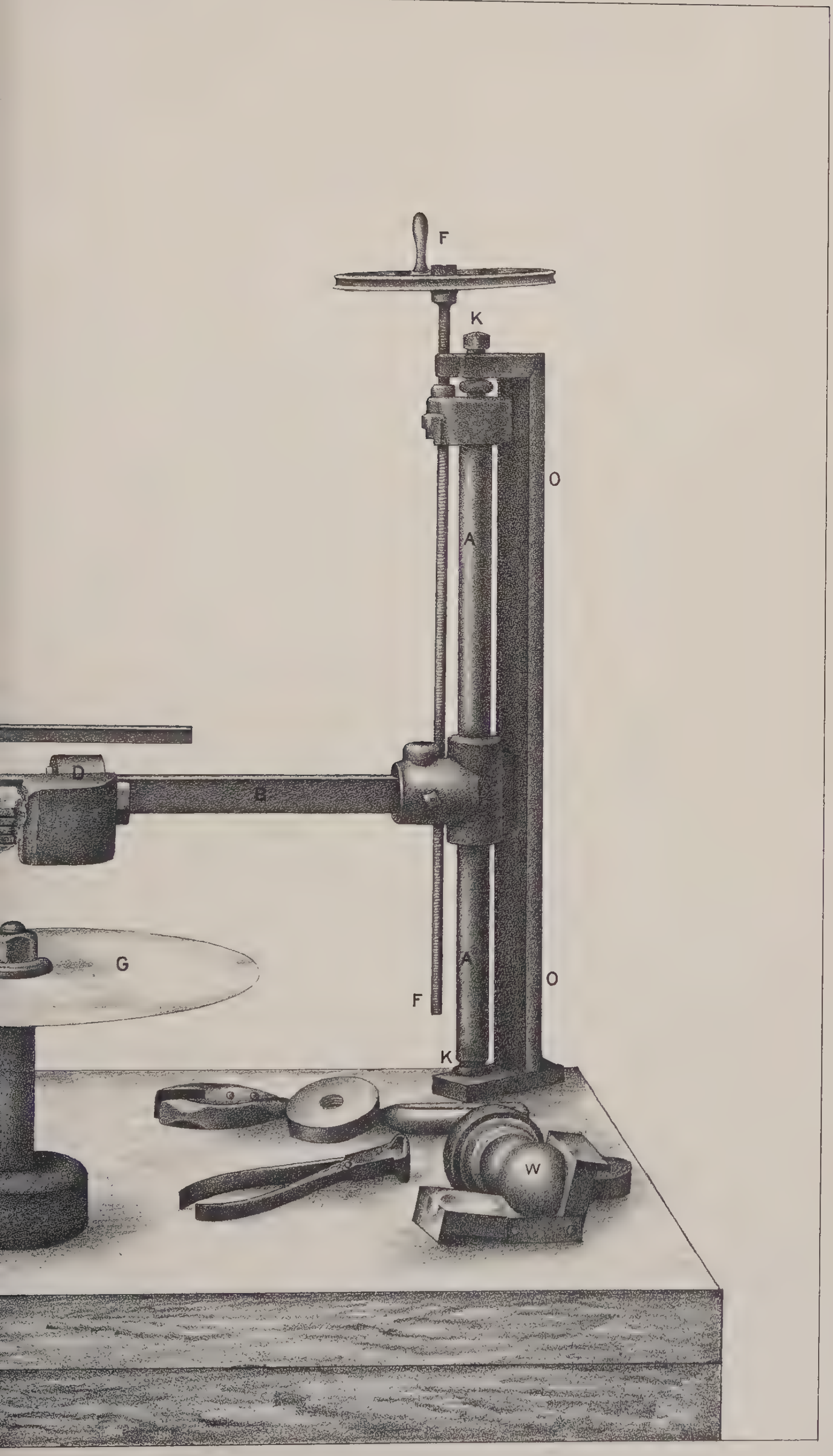
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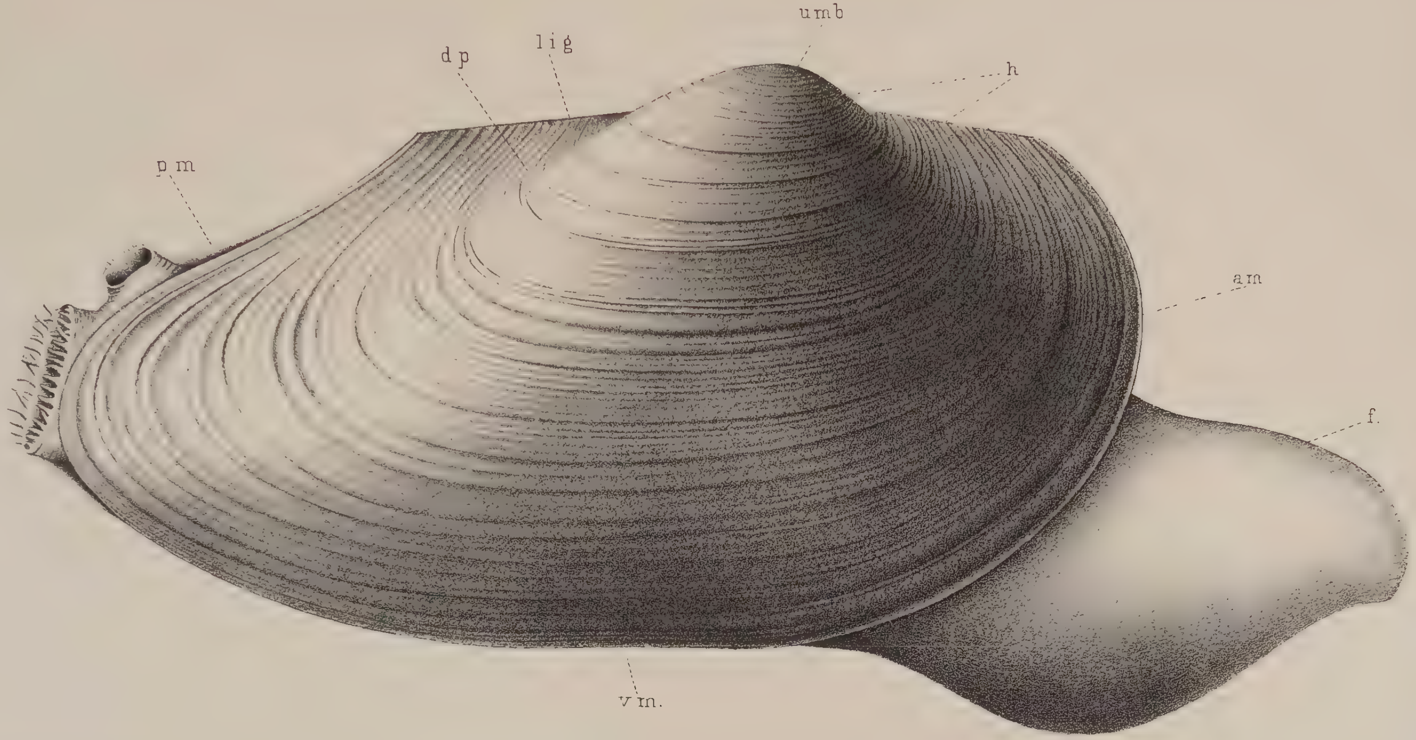
PLATE III.

Exterior of shell.

a. m.	Anterior margin.	lig.	Ligament.
p. m.	Posterior margin.	f.	Foot, extended.
v. m.	Ventral margin.	umb.	Umbo.
d. p.	Dorsal portion.	h.	Hinge-line.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p m
a m
f.
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PLATE IV.

Fig. 1 — Exterior of shell, dorsal view.

a. p. Anterior portion.
p. p. Posterior portion.
d. p. Dorsal portion.
lig. Ligament.
l. v. Left valve.
r. v. Right valve.

Fig. 2 — Young shell before leaving the gills.

v. Valves.
h. l. Hinge-line.
a. a. The animal.
by. Byssus.
c. Cilia.
s. Serrated spines.

Fig. 3 — Epidermis.

p. c. Pigment cells.

Fig. 4 — Prismatic layer, transverse section.

Fig. 5 — Narceous layer, transverse section.

Fig. 6 — Section of the shell.

ep. Epidermis.
pr. Prismatic layer.
nac. Nacreous layer.

Fig. 7 — Enlargement of secreting tubes of the liver.

Fig. 8 — Parasite frequently found on the animal.

Fig. 9 — Enlargement of tentacles of the branchial siphon.

Fig. 10 — Enlargement of muscular fibres.

Fig. 11 — Mass of the tubules of the liver.

Fig. 12 — Young Anodonta.

ANODONTA FLUVIATILIS.

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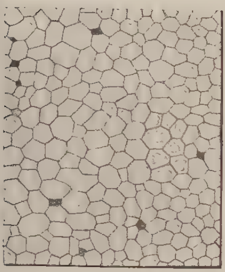

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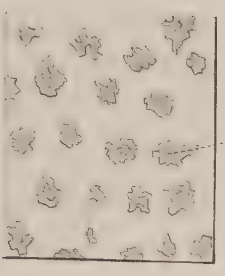

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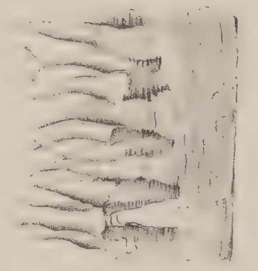

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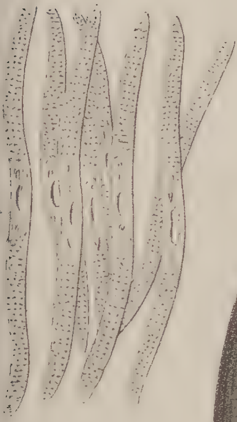

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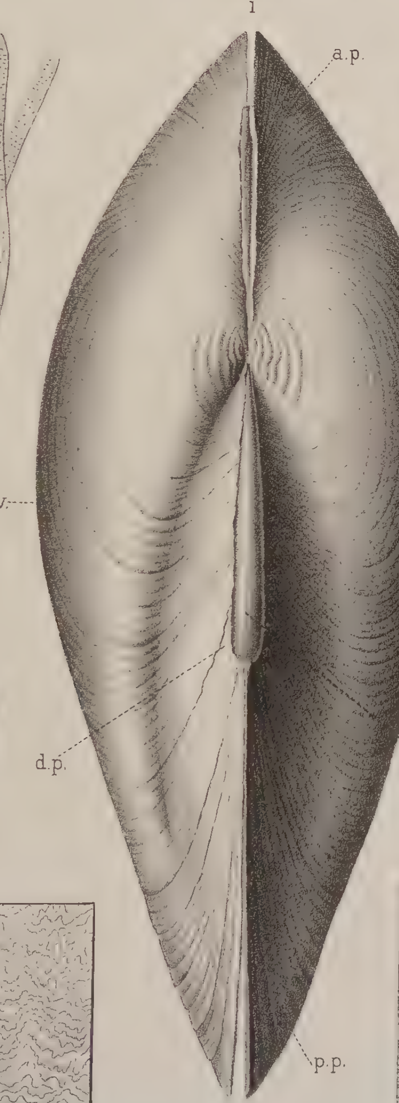

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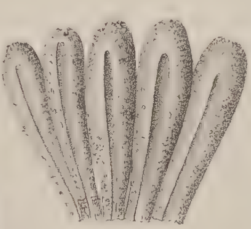

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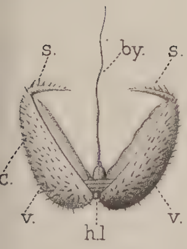

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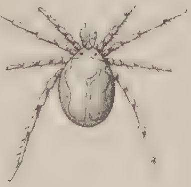

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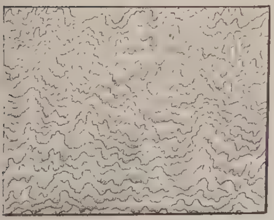

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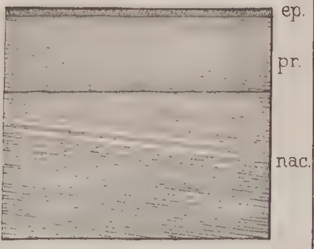

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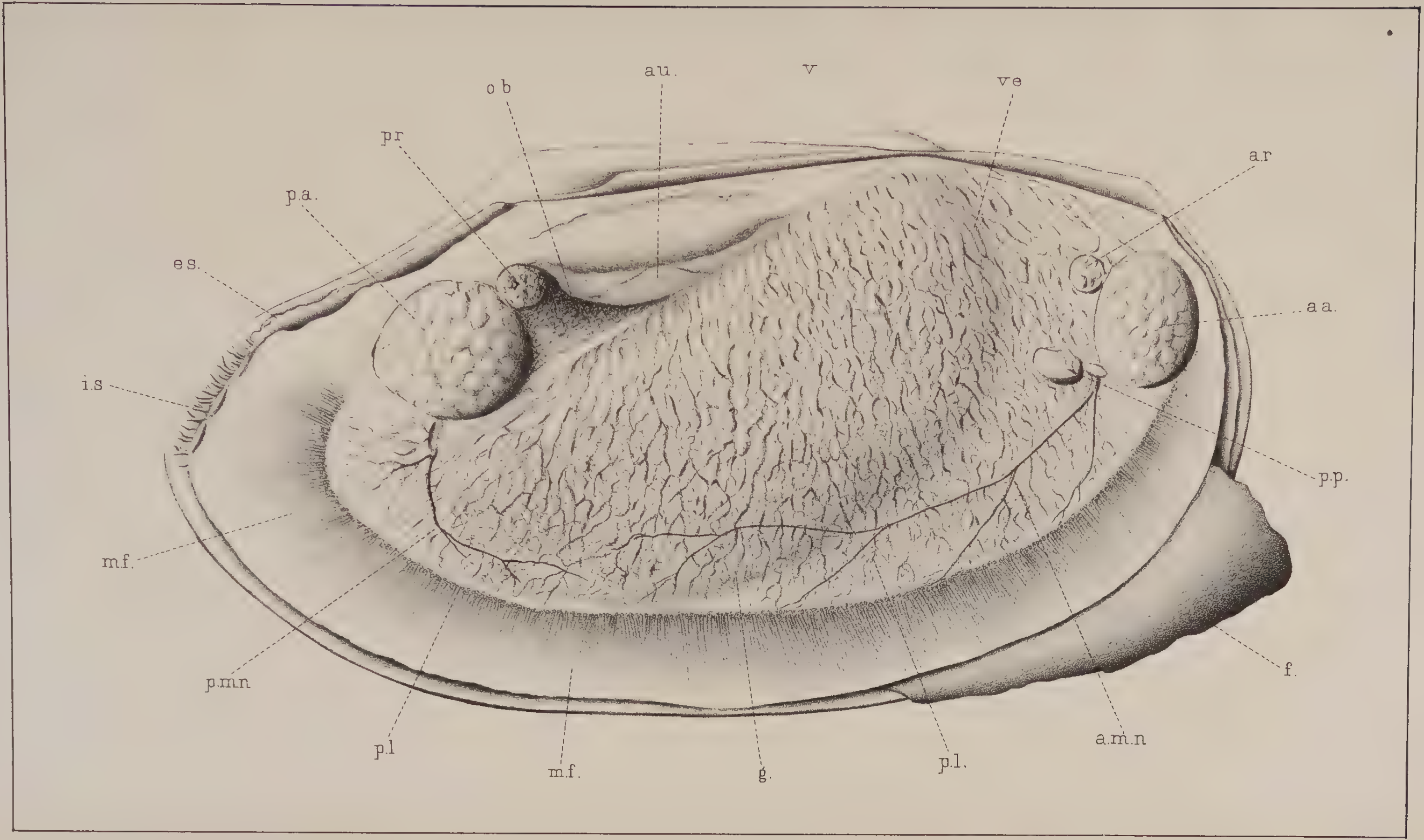
PLATE V.

Fig. 1 — Showing blood vessels of the mantle.

a. a.	Anterior adductor muscle.	i. s.	Inhalent siphon.
a. r.	Anterior retractor muscle.	e. s.	Exhalent siphon.
p. p.	Protractor pedis muscle.	p. a.	Posterior adductor muscle.
f.	Foot.	p. r.	Posterior retractor muscle.
a. m. n.	Anterior mantle nerve.	o. b.	Organ of Bojanus, or renal organ.
p. l.	Pallial line.	au.	Auricles.
g.	Gill.	v.	Ventricle.
m. f.	Muscular fibres.	ve.	Veins.
p. m. n.	Posterior mantle nerve		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a.m.n
p.l
m.f.
g.
p.l.

PLATE VI.

Fig. 1 — The animal is dissected to show the intestinal canal.

a. a. Anterior adductor muscle.
m. Mouth.
f. Foot.
g. Gill.
t. Tentacles of inhalent siphon.
b. c. Branchial chamber.
c. c. Cloacal chamber.
a. Anus.
p. a. Posterior adductor muscle.
p. r. Posterior retractor muscle.

v. Ventricle.
p. Pericardium.
au. Auricle.
i. c. Intestinal canal.
i. c̀, i. ĉ, Points of attachment of intestine.
r. Rectum.
l. Liver.
s. Stomach.

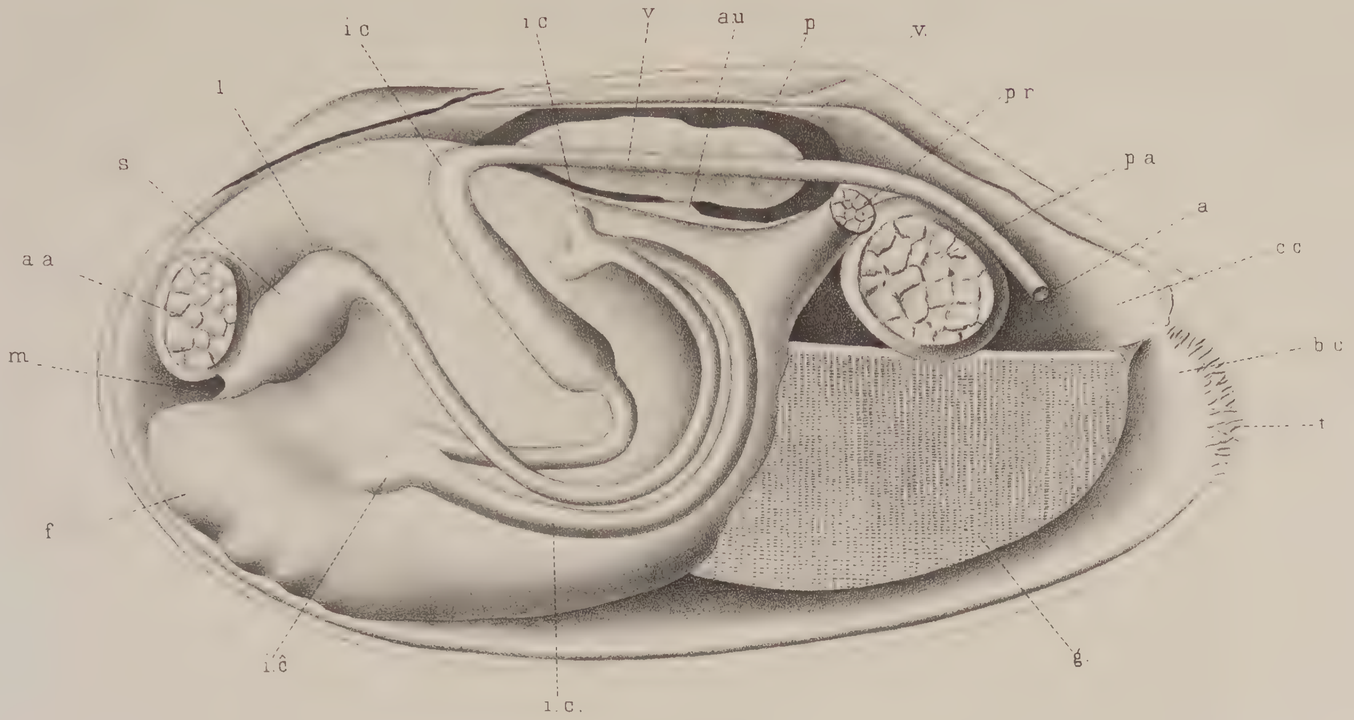
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PLATE VII.

Fig. 1—Enlargement of outer surface of gill.

g. p.	Gill plates.	c. i.	Cilia.
ch.	Chitinous rods.		

Fig. 2.—Enlargement of capillaries of gills.

Fig. 3.—Enlargement of veins of mantle.

Fig. 4.—Showing specimen with mantle removed.

a. a.	Anterior adductor muscle.	r.	Rectum.
a. r.	Anterior retractor muscle.	a.	Anus.
p. p.	Protractor pedis muscle.	p. a.	Posterior adductor.
m.	Mouth.	p. r.	Posterior retractor.
l. p.	Labial palpi.	p.	Pericardium.
f.	Foot.	v.	Ventricle.
b. c.	Branchial chamber.	au.	Auricle.
t.	Tentacles of inhalent-siphon.	m.	Mantle.
c. c.	Cloacal chamber.	g.	Gill.

Fig 5.—Showing the mantle and gills thrown back exposing the foot, body and labial palpi.

m.	Mantle.	o. g.	Outer gill.
mo.	Mouth.	b. c.	Branchial cavity.
l. p.	Labial palpi.	t.	Tentacles of inhalent siphon.
f.	Foot.	op.	Opening through the gill for passage of the body.
b.	Body.		
i. g.	Inner gill.		

ANODONTA FLUVIATILIS.

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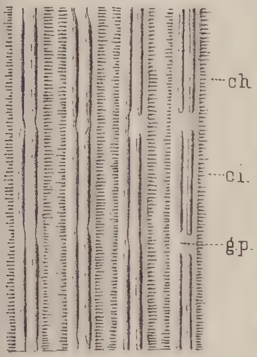

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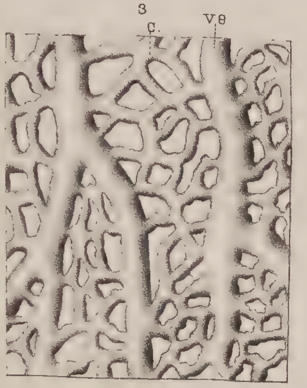

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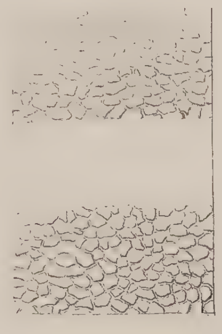

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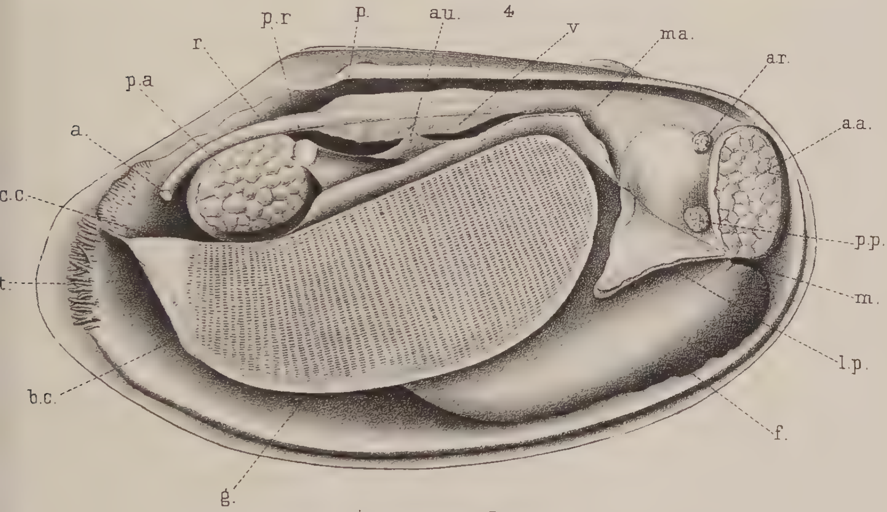

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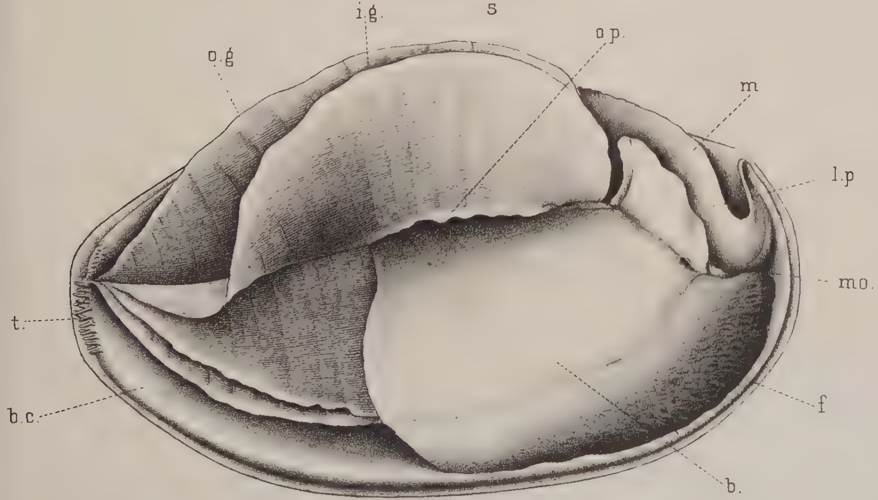

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PLATE VIII.

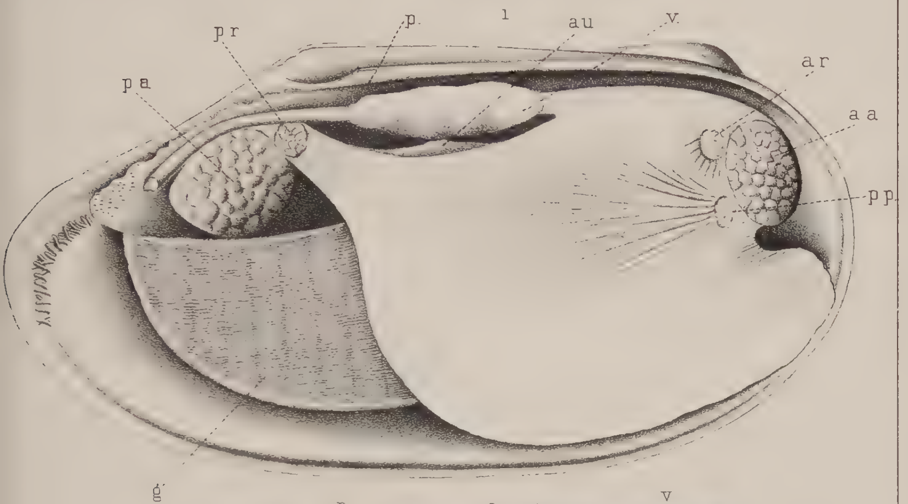
Showing the muscles of the foot and body.

The same letters apply to the same organs on each of the figures.

Figs. 1, 2, 3.

a. a. Anterior adductor muscle.
a. r. Anterior retractor muscle.
p. a. Posterior adductor muscle.
p. r. Posterior retractor muscle.
p. p. Protractor pedis muscle.
g. Gills.
p. Pericardium.
au. Auricle.
v. Ventricle.

ANODONTA FLUVIATILIS.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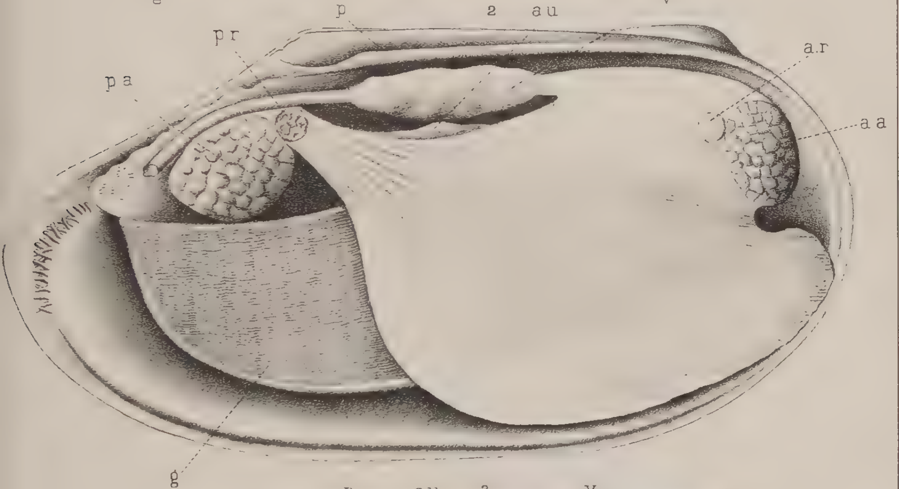
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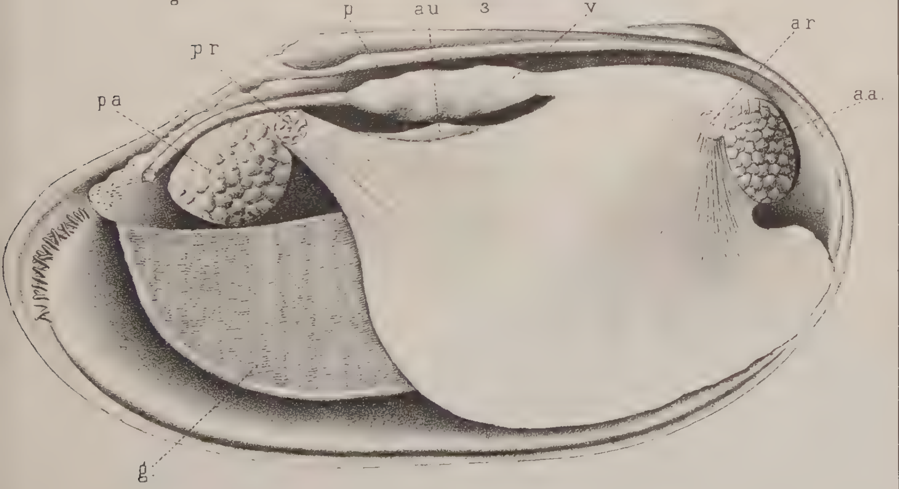
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PLATE IX.

Fig. 1.— A dorsal veiw of the pericardial cavity, mantle not removed.

p. a. Posterior adductor.
r. Posterior retractor.
p. m. Mantle.
o. b. Organ of Bojanus.
au. Auricle.
v. Ventricle.
p. Pericardium.

Fig. 2.— A dorsal view of the pericardial cavity, mantle removed.

p. a. Posterior adductor.
p. r. Posterior retractor.
r. Rectum.
p. Pericardial cavity.
v. Ventricle.
au. Auricle.
o. b. Organ of Bojanus.

Fig. 3.— The valve leading from the auricle to the ventricle.

val. Valve.
v. Ventricle.
au. Auricle.

Fig. 4.— Organ of Bojanus or renal organ.

p. a. Posterior adductor.
r. Rectum.
a. Anus.
p. r. Posterior retractor.
p. Pericardial cavity.
v. Ventricle.
o. p. g. Opening leading from the floor of the pericardium to glandular sac.
o. b. c. Opening leading from the non-glandular sac to the branchial chamber.
n. g. s. Non-glandular sac.
g. s. Glandular sac.
o. e. s. Opening leading from the glandular to the non-glandular sac.
au. Auricle.

Fig. 5. - Floor of the pericardium, showing the two openings (o. p. g.) into the renal organ.

Fig. 6.— Floor of non-glandular sac, showing openings into the glandular sac and branchial chamber, and the openings from the glandular sac as shown in Fig. 5.

Fig. 7.-- Diagram showing more plainly than fig. 4 the passage leading from the floor of the pericardium to the branchial chamber.

Fig. 8.— Showing nerves in place.

c. g. Cerebral ganglion.
c. c. The commissural cord connecting the cerebral ganglia.
ps. g. Posterior ganglia.
ps. c. Commissural cord connecting the cerebral and posterior ganglia.
p. g. Pedal ganglion.
pe. c. Commissural cord connecting the pedal and cerebral ganglia.
a. m. n. Anterior mantle nerve.
g. n. The nerve whose branches are the nerves of the gills.
p. m. n. Posterior mantle nerve.

ANODONTA FLUVIATILIS.

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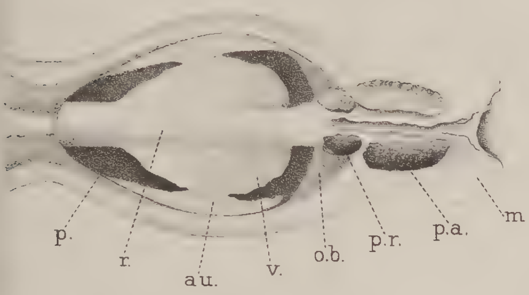

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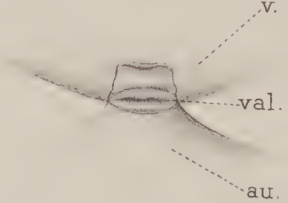

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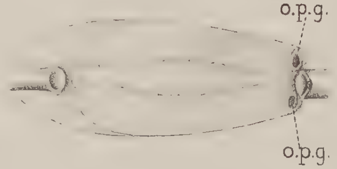

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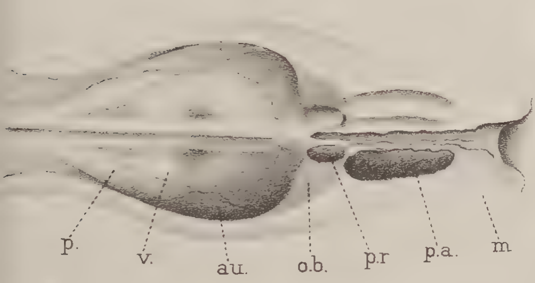

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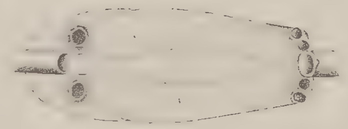

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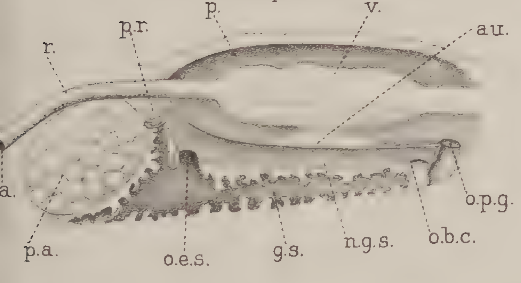

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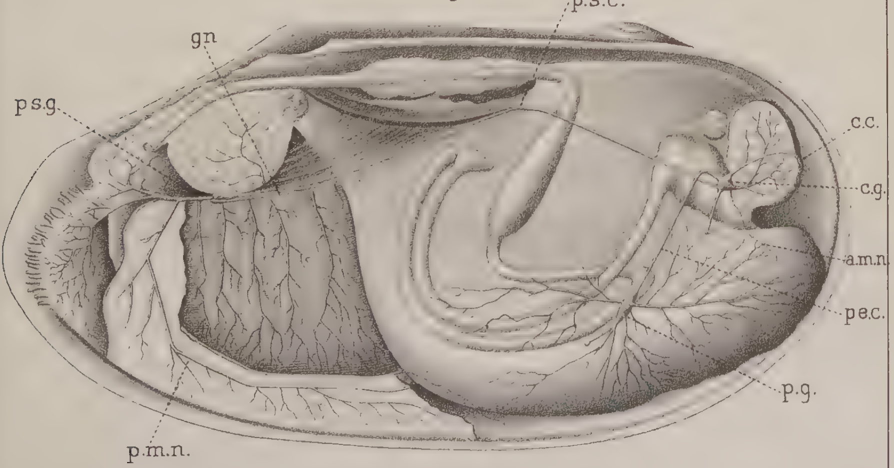

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PLATE X.

Showing the circulatory system as described in the text. The arteries are represented by dark shading; the veins and large sinus connecting with the vena cava by lighter shading; the intestinal canal and other parts will be easily recognized by still lighter shading.

a. ao. Anterior aorta.
p. ao. Posterior aorta.
s. Sinus.
ram. Ramifications of arteries.
r. v. Ramifications of veins.

The larger veins and arteries only are represented here; to endeavor to represent more in so small a space would only confuse the student.

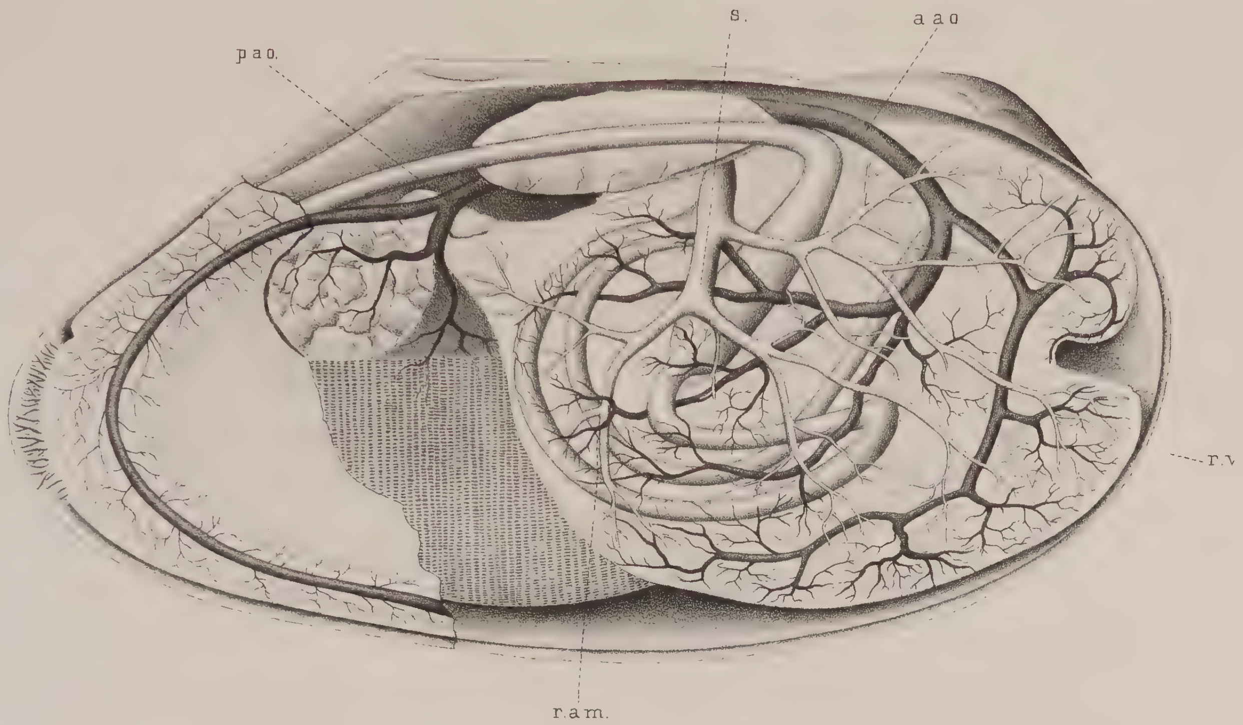
p a o.
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PLATE XI.

Fig. 1.—Interior of shell.

a. a.	Impression of anterior adductor muscle.
p. a.	Impression of posterior adductor muscle.
a. r.	Impression of anterior retractor muscle.
p. p.	Impression of protractor pedis muscle.
p. r.	Impression of posterior retractor muscle.
p. l.	Impression of pallial line.
m. f.	Impression of umbonal muscles.
p. l. m.	Pallial line muscles.
r. t.	Rudimentary teeth.
mar.	Markings left by the adductor muscles.

Fig. 2.—Interior of shell of *Unio complanatus.*

a. a.	Anterior adductor.
a. r.	Anterior retractor.
p. p.	Protractor pedis.
p. a.	Posterior adductor.
p. r.	Posterior retractor.
p. l.	Pallial line.
c. t.	Cardinal teeth.
lat.	Lateral teeth.

Fig. 3.—The mantle thrown back, showing the labial palpi (l. p.) in position.

Fig. 4.—Transverse section.

sh.	Shell.
m.	Mantle.
o. g.	Outer gill.
i. g.	Inner gill.
f.	Foot.
o. b.	Organ of Bojanus.
v.	Ventricle.
au.	Auricle.
p.	Pericardium.
r.	Rectum.

ANODONTA FLUVIATILIS.

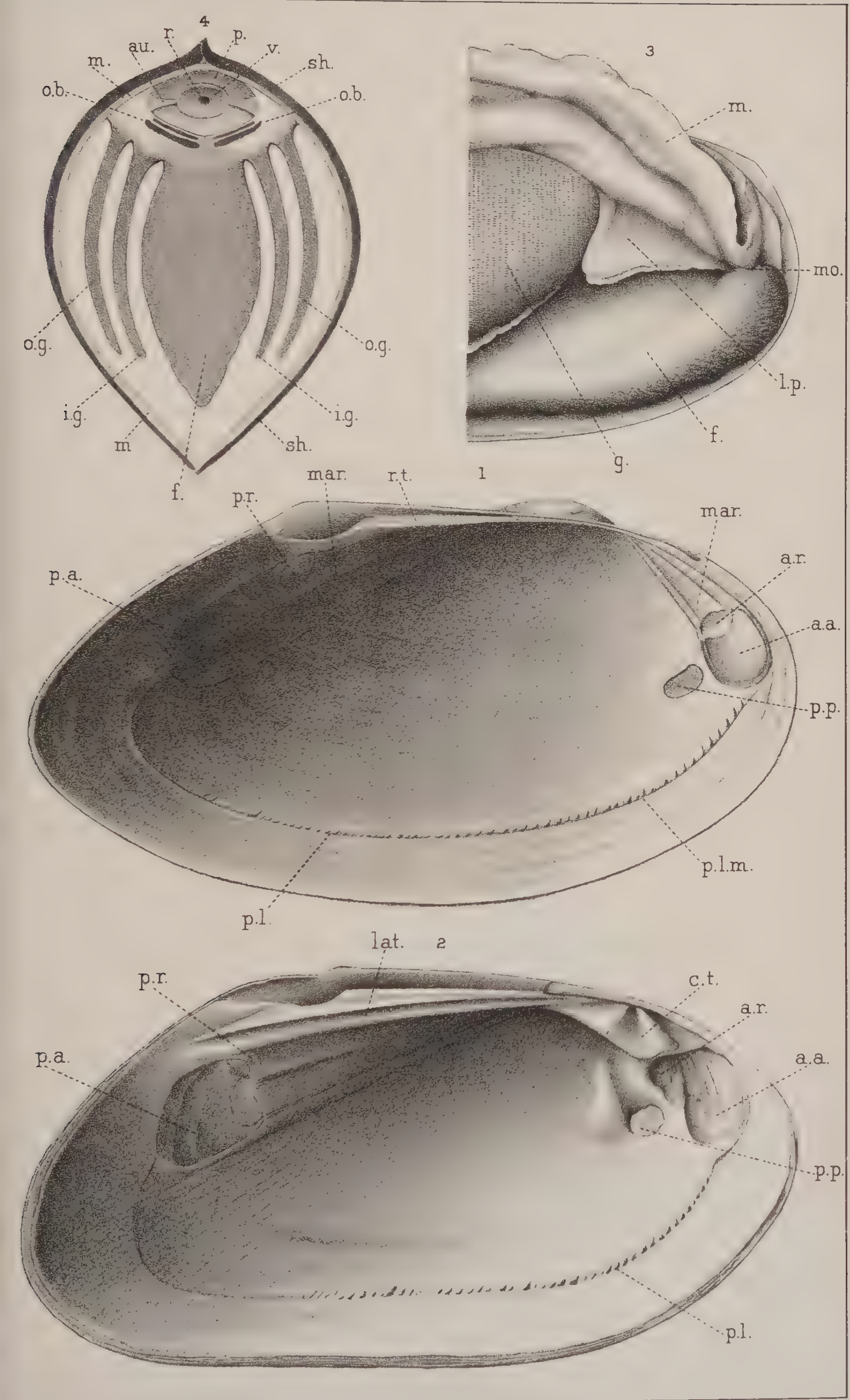

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PLATE XII.

The nerves dissected from the animal and enlarged.

c. g.	Cerebral ganglia.
c. c.	Commissural cord connecting cerebral ganglia.
ps. g.	Posterior ganglia.
ps. c.	Commissural cord connecting the cerebral and posterior ganglia.
p. g.	Pedal ganglion.
pe. c.	Commissural cord connecting the pedal and cerebral ganglia.
g. n.	The nerve whose branches supply the gills.
b. n.	The nerves of that part of the mantle constituting the inhalent and exhalent siphons.
. m. n.	Anterior mantle nerve.
p. m. n.	Posterior mantle nerve.
au. s.	Auditory sac.
a. a. n.	Anterior adductor nerve.
p. h. n.	Peripheral nerve.

ANODONTA FLUVIATILIS.

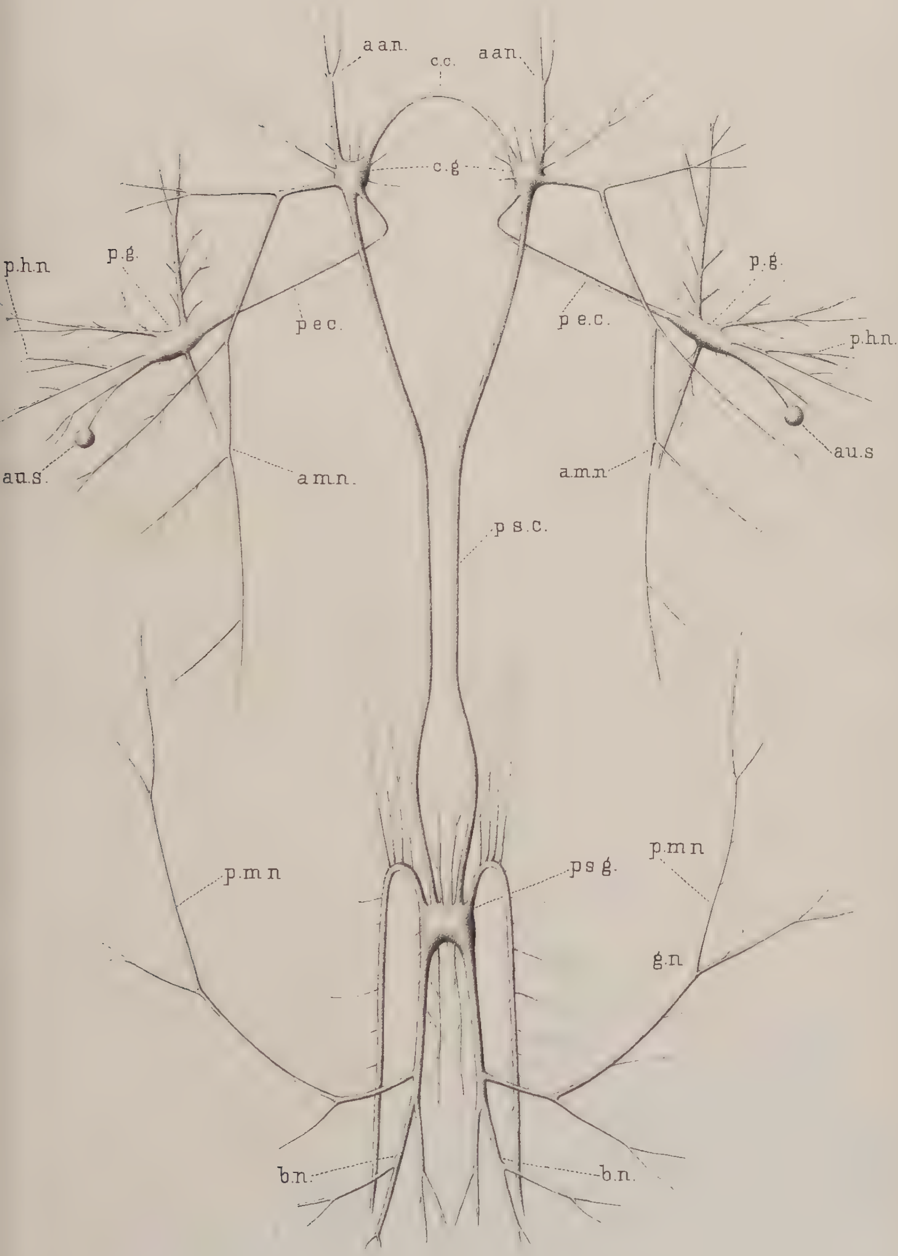

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PLATE XIII.

FIG. 1.—Enlargement of the posterior ganglia.
FIG. 2.—Enlargement of the cerebral ganglion.
FIG. 3.—Enlargement of the pedal ganglion.
FIG. 4.—The young of anodon taken from the gill.
FIG. 5.—The labial palpi held open and at right angles to the body, showing their inner surfaces.
l. p. Labial palpi. m. Mouth.
FIG. 6.—One of the labial palpi.
FIG. 7—Two of the ridges on the labial palpi enlarged, showing cilia.
FIG. 8.—Enlargement of interior of a palpus.
FIG. 9.—Enlargement of exterior of a palpus.

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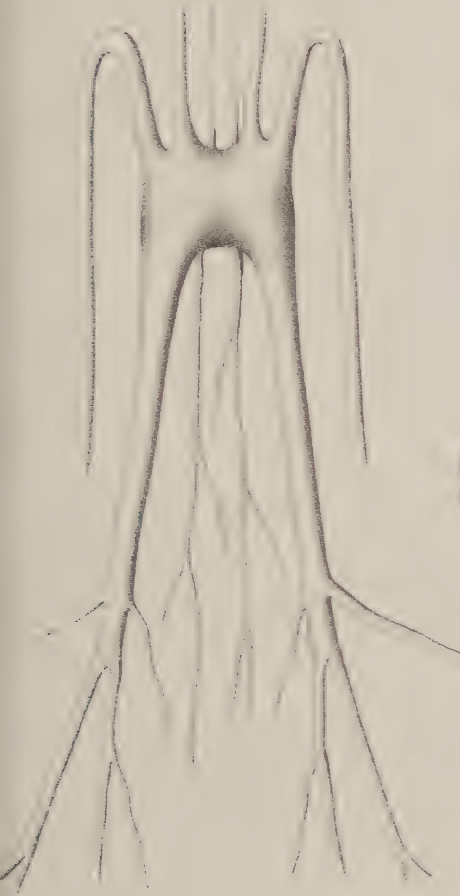

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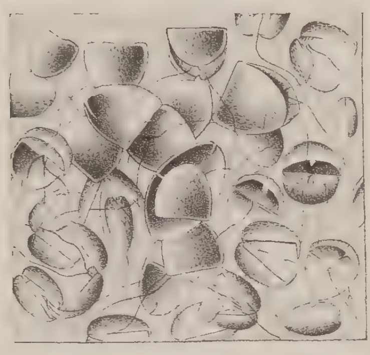

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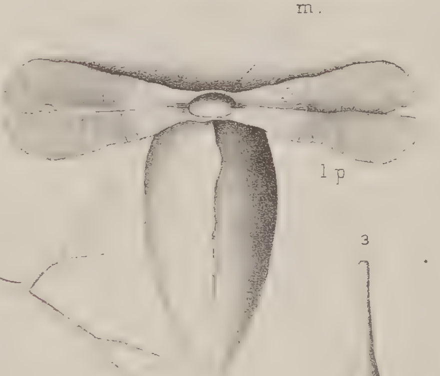

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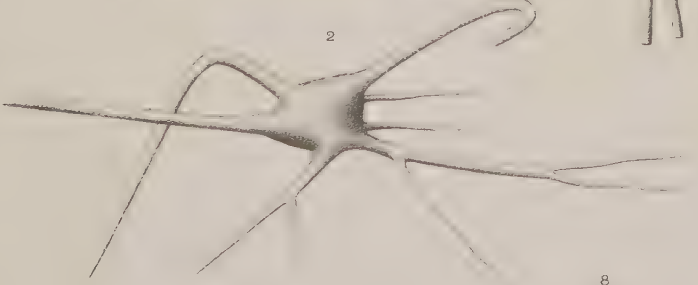

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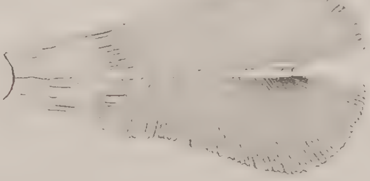

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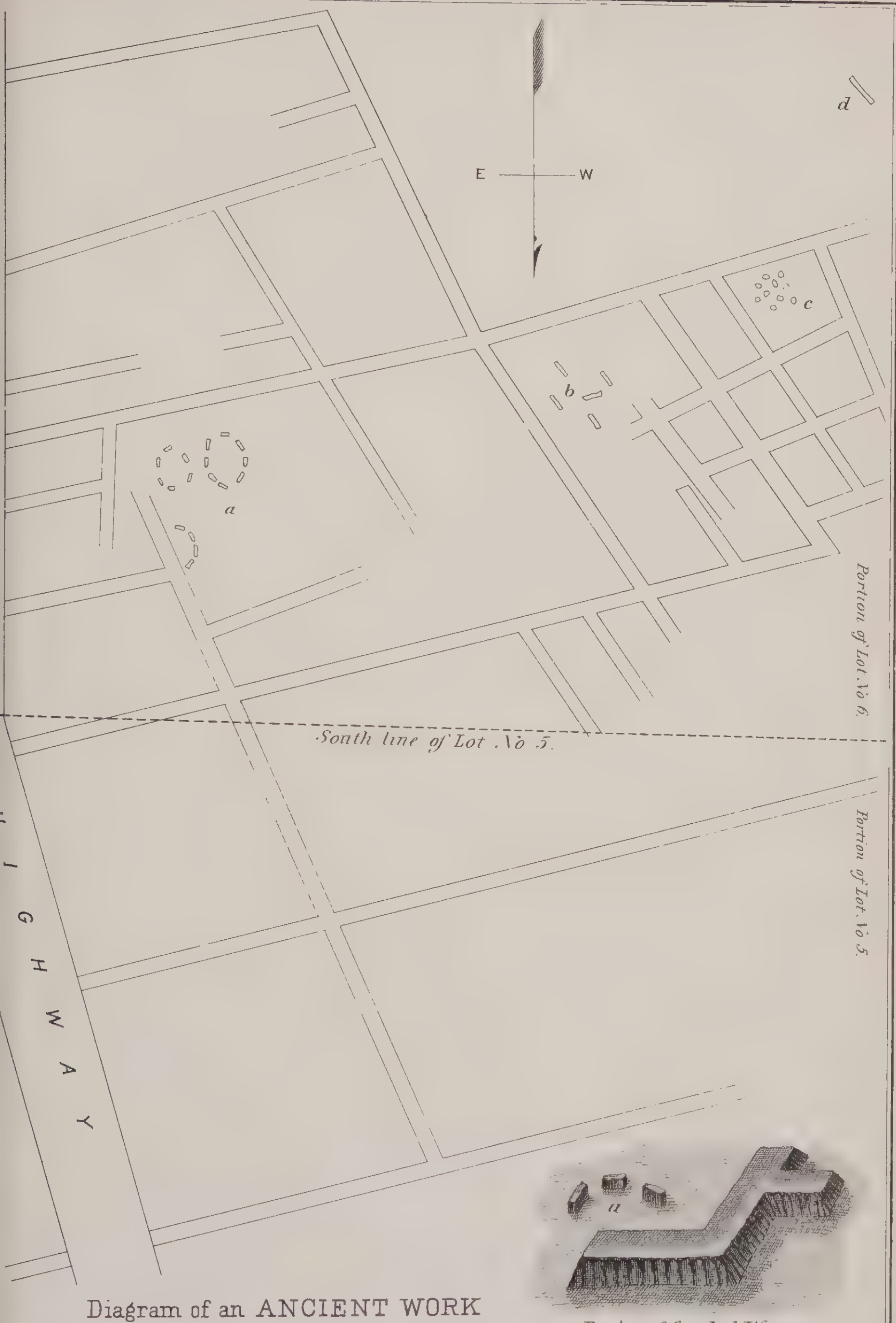

Portion of Graded-Way.

Diagram of an ANCIENT WORK
on Bluff Point, Yates Co., N.Y.
by S. HART WRIGHT, PH. D.

Scale 112 feet to one inch.

- *a. Vertical Slabs.*
- *b. do do irregular group.*
- *c. Boulders.*
- *d. A large vertical slab.*

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PLATE XV.

EQUISETIDES WRIGHTIANA.*

FIG. 1. The stem, natural size. Copy after Dawson.
2. A transverse section in outline.
3. "Leaf of sheath."

CYCLOSTIGMA AFFINE.

FIG. 4. *Cyclostigma affine* — surface showing leaf scars.
5. " leaf-base, enlarged.

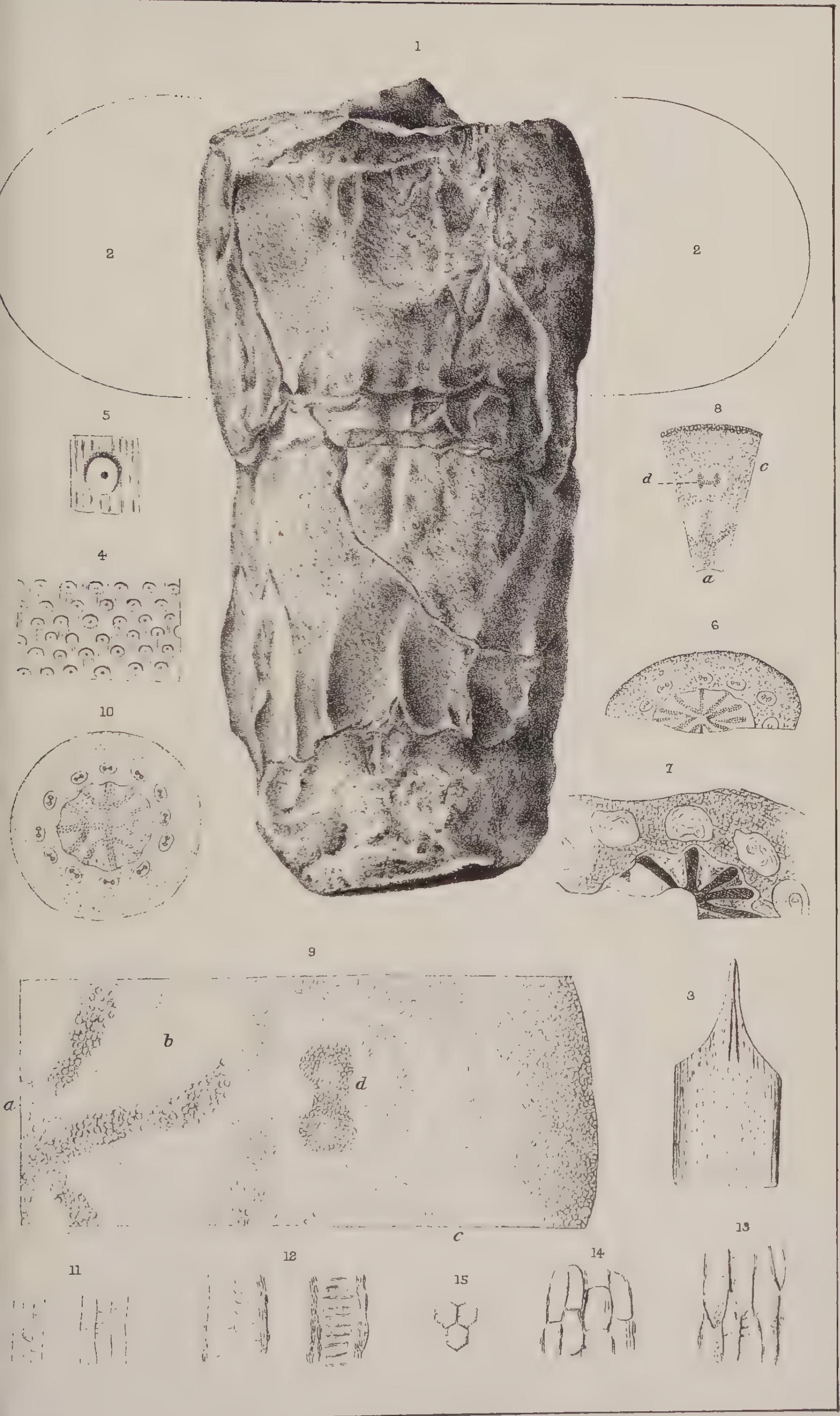
ASTEROPTERIS NOVEBORACENSIS.

FIGS. 6, 7. *Asteropteris noveboracensis*, cross-section, natural size and enlarged.
8. *A. noveboracensis*, portion enlarged, showing one vascular bundle.
9. " " portion enlarged twelve times, showing rays and vascular bundle.
10. " " stem restored in cross-section.
11, 12. " " scalariform vessels, × 100.
13. " " prosenchyma of outer cylinder, × 40.
14, 15. " " parenchyma of inner cylinder, × 40.

In the above figures, *a* represents radii of axis, *b* cellular tissue of axis, *c* outer prosenchyma, *d* leaf-bundles.

* NOTE (Fig. 1.) — The peculiar aspect and markings of this figure, as originally published in the *Quarterly Journal* of the London Geological Society, led the writer to suspect its relations to the Crustacea. Through the kindness of Mr. Wright, who procured the loan of the specimen, I have had an opportunity of seeing the original, which is very correctly represented in the figure. The body is not cylindrical, but broadly elliptical or subovate, enlarging above. The ridges occur only upon one side, having a symmetrical relation with the form of the body, while the other parts are free from them, and the joints are overlapping. The form of this body, together with the character of the ridges and the finer surface markings, suggest its crustacean origin. The lateral scars have probably been the points of attachment for spiniform processes as in Stylonurus. The fragment represents two of the abdominal segments of a form not unlike Stylonurus, though comparatively longer than in the ordinary forms of that genus, and in this respect resembling Stimonia.

J. H.



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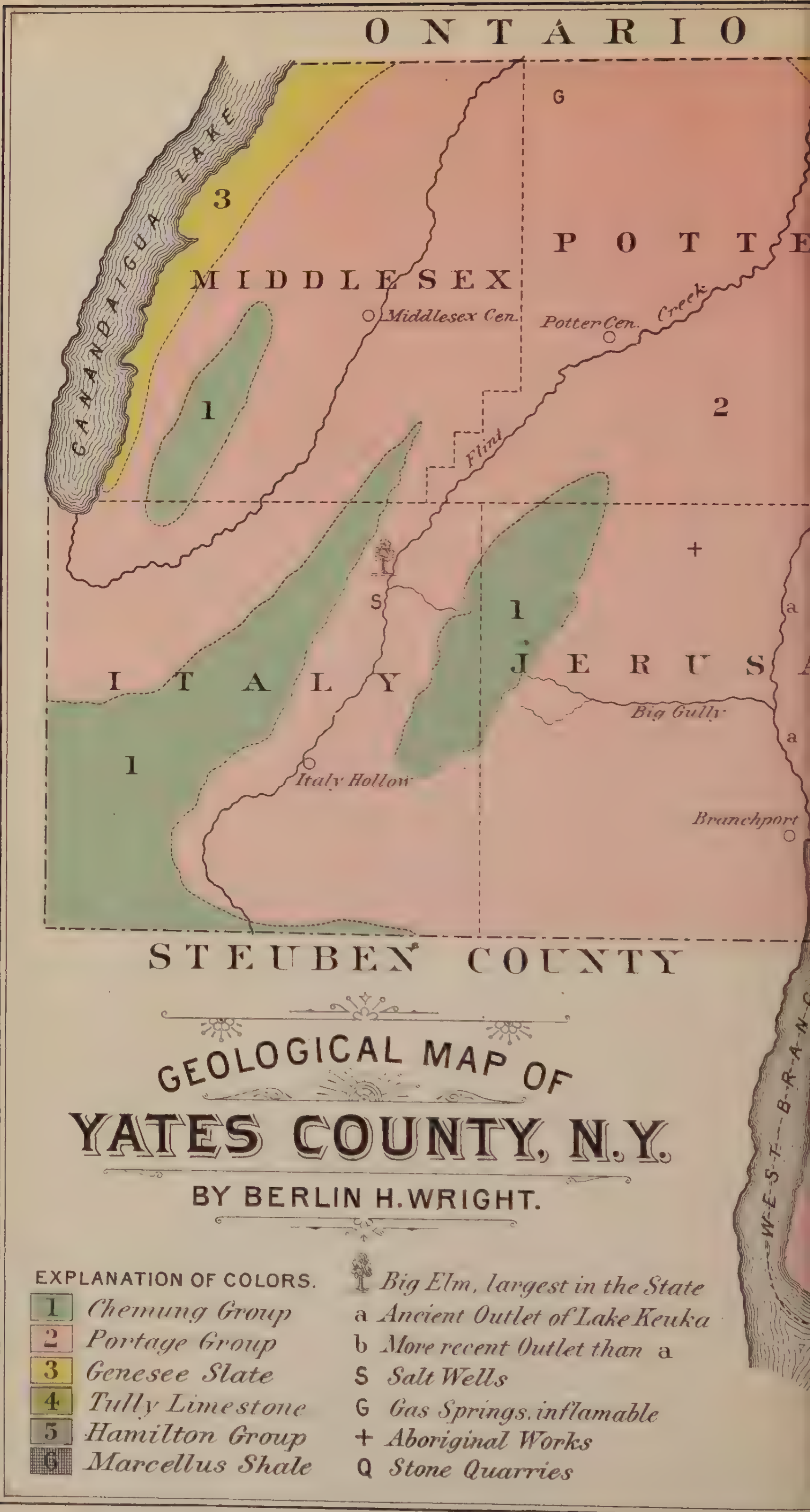

GEOLOGICAL MAP OF
YATES COUNTY, N.Y.

BY BERLIN H. WRIGHT.

EXPLANATION OF COLORS.

1	*Chemung Group*
2	*Portage Group*
3	*Genesee Slate*
4	*Tully Limestone*
5	*Hamilton Group*
6	*Marcellus Shale*

🌳	*Big Elm, largest in the State*
a	*Ancient Outlet of Lake Keuka*
b	*More recent Outlet than a*
S	*Salt Wells*
G	*Gas Springs, inflamable*
+	*Aboriginal Works*
Q	*Stone Quarries*

Plate 16 A

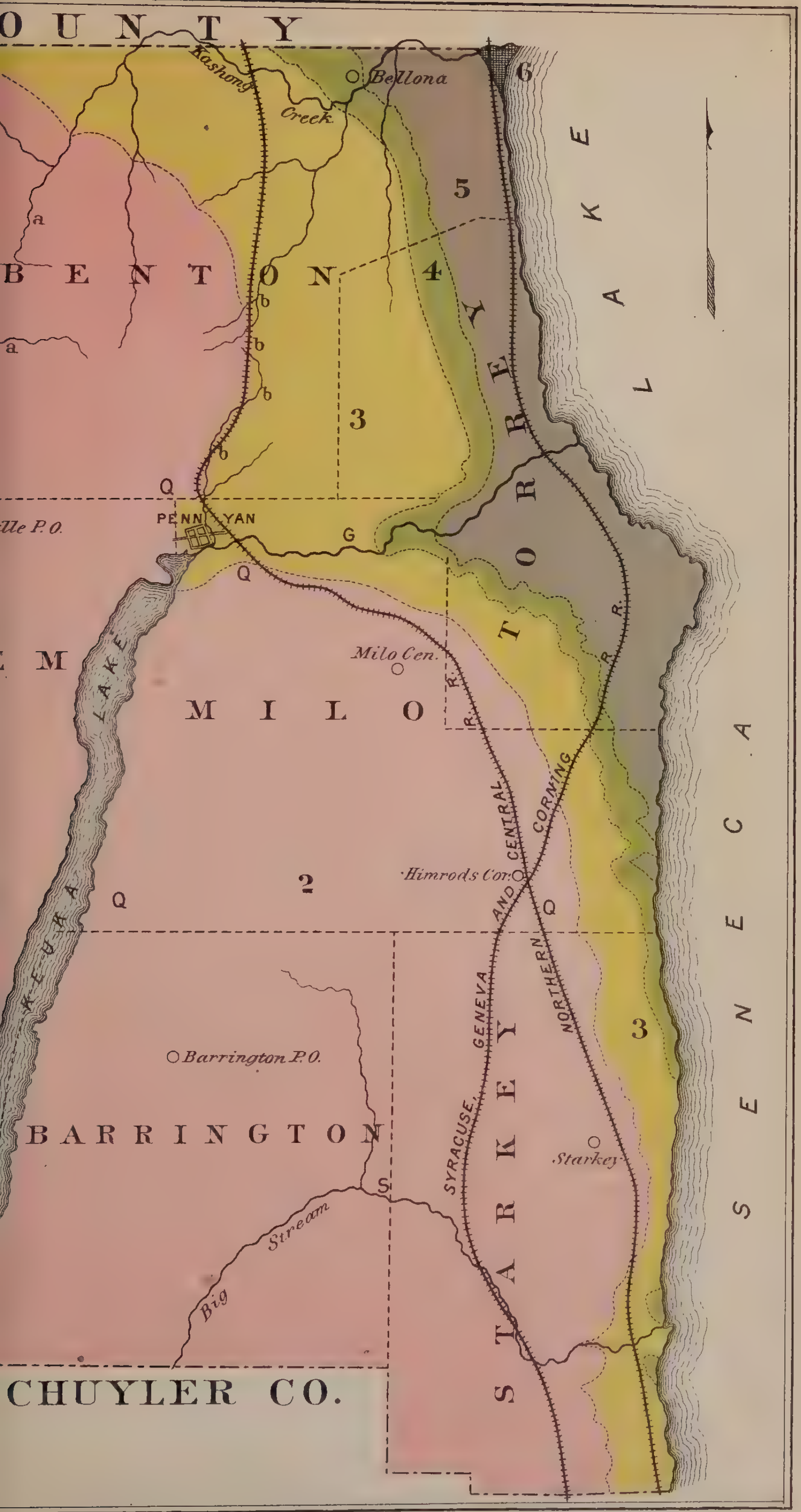

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PLATE XVI.

ZAPHRENTIS CANADENSIS.

Fig. 1. A longitudinal section through the center, showing the tabulæ.
Fig. 2. A longitudinal section from near the side of the corallum, showing the vertical lamellæ.
Fig. 3. A transverse section through the cup, showing the number and size of the lamellæ and the position of the fossette.

Hudson River group, Ohio.

HELIOPHYLLUM HALLI.

Fig. 4. A vertical section through the center.
Fig. 5. A transverse section through the lower part of the cup, showing the lamellæ and vescicular tissue.

Hamilton group, N. Y.

CYSTIPHYLLUM AMERICANUM.

Fig. 6. A longitudinal section of a corallum, showing the characteristic structure. *Hamilton group, N. Y.*

CYATHOPHYLLUM RUGOSUM.

Fig. 7. A horizontal section of a mass of corallites.

Upper Helderberg group, Falls of the Ohio.

MICHELINIA STYLOPORA.

Fig. 8. A vertical section of a large mass showing the usual characters of the species. *Hamilton group, N. Y.*

TETRADIUM ONTARIO, *n. sp.*

Fig. 9. A horizontal section showing the form of the tubules in a very satisfactory manner.

Clinton group, Shore of Lake Ontario.

STROMATOPORA NODULATA ?

Fig. 10. A horizontal section of a portion of a specimen.
Fig. 11. A vertical section of the same species.

Upper Helderberg group, Kelly's Island, Ohio.

These illustrations of translucent sections of fossil corals are given to accompany the paper on the "Machinery and Methods of Cutting Specimens of Rocks and Fossils" at the State Museum, pp. 121–124. The figures show in a very satisfactory manner the structure of the specimens, and express the value of similar sections in the study of fossils.

CTENACANTHUS WRIGHTI.

Page 206.

Fig. 12. Lateral view of the specimen described.
Fig. 13. A small portion enlarged to show the surface sculpturing.
Fig. 14. An outline showing the form of a transverse section.

Chemung group, Yates Co., N. Y.

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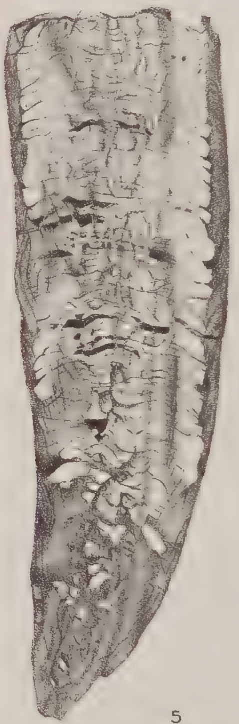

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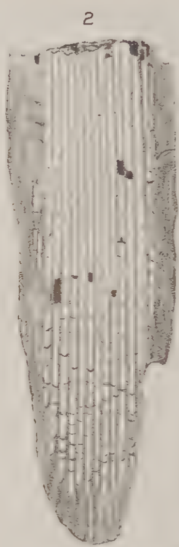

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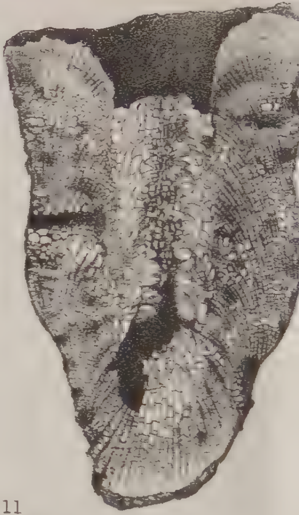

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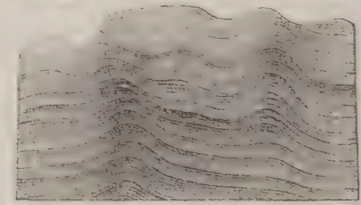

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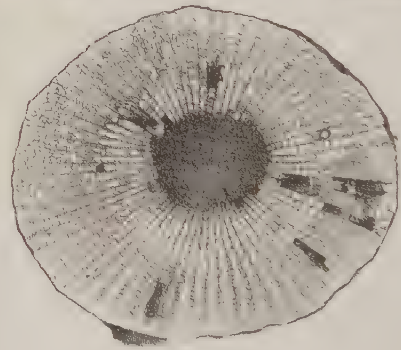

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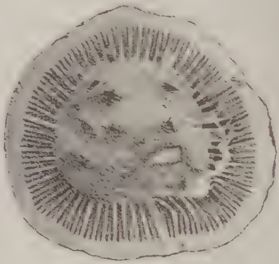

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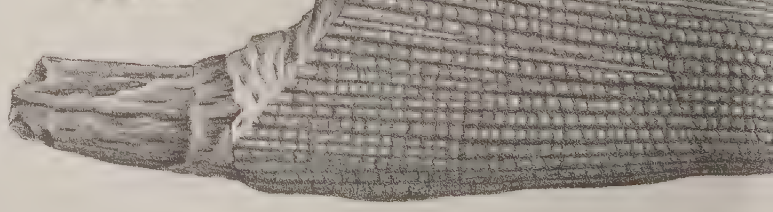

Plate 16.

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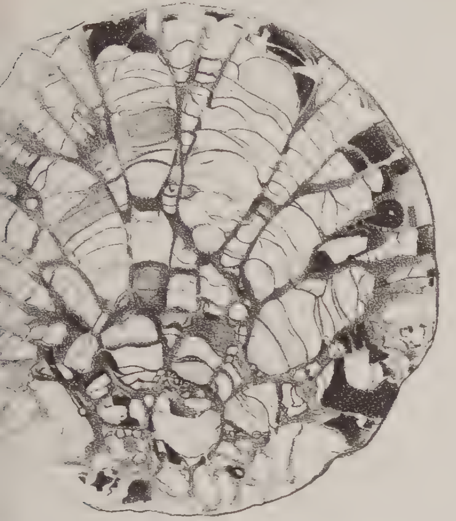

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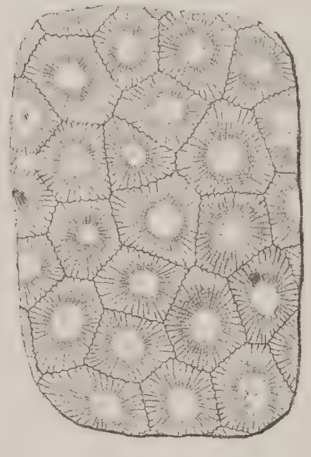

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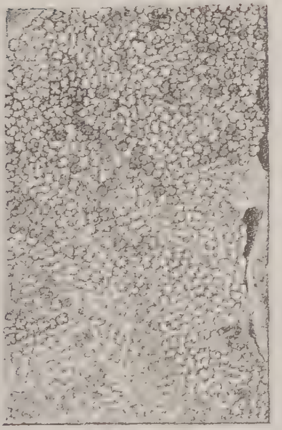

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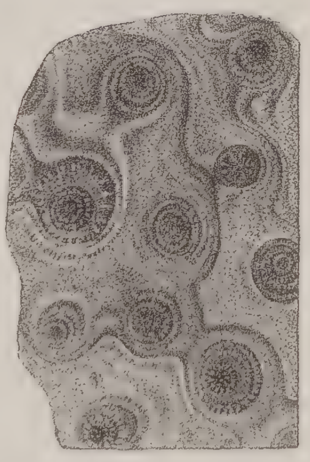

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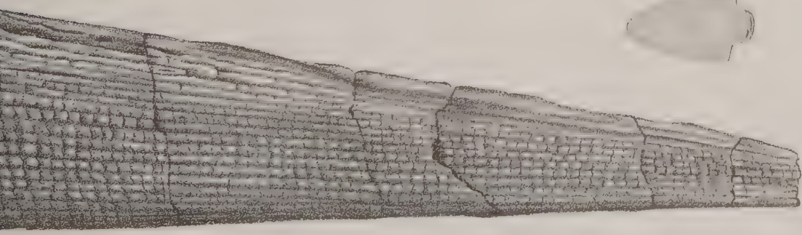

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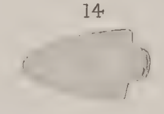

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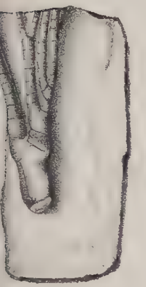

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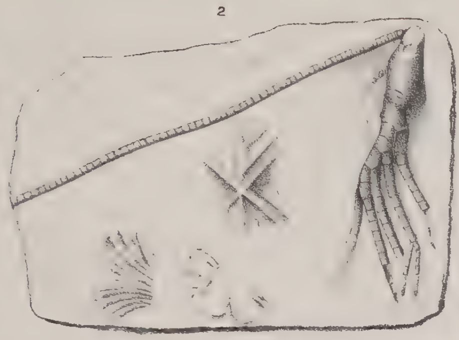

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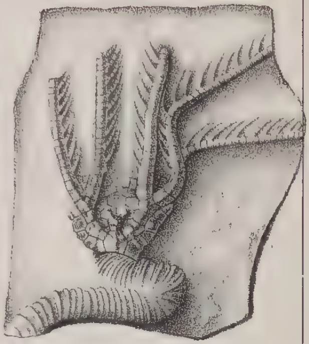

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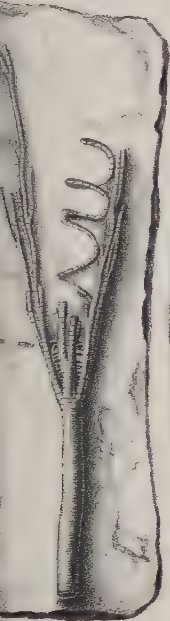

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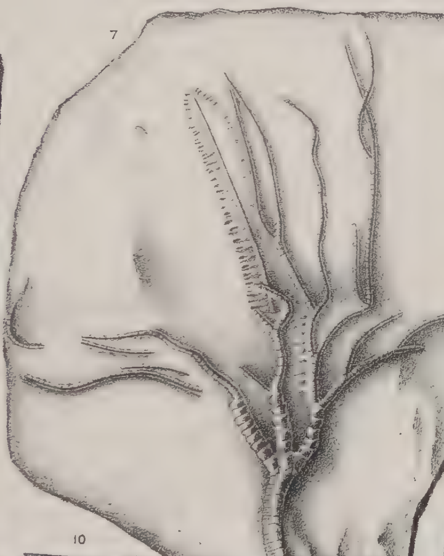

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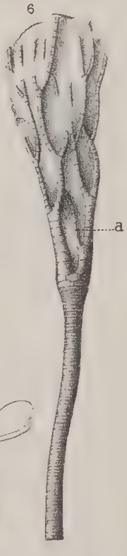

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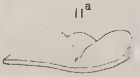

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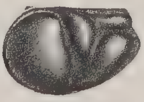

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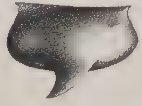

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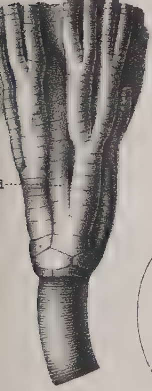

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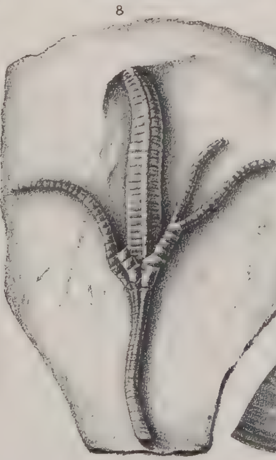

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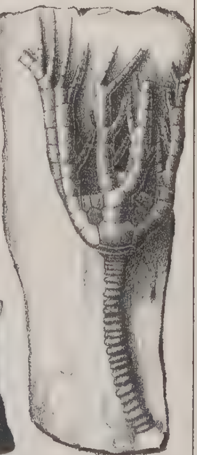

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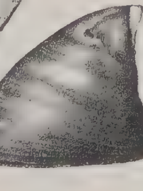

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PLATE XVIII.

Figs. 1–8. Representing a series of elongate turbinate or obconical forms, beginning with the simple *Cyathophycus reticulatus*, Walcott—fig. 1, followed by the prismoidal *Dictyophyton prismaticum*, then the similar form *D. Conradi*, sometimes with several nodes and undulations in the upper part. Figs. 5, 6, 7 show a further development of the number of nodes and annulations in the species *D. annulatum*, *D. nodosum* and *D. tuberosum*.

Fig. 2*a*. A transverse section of *D. prismaticum*, showing its regular octagonal form.

Fig. 4*a*. Shows the more compressed form of *D. Conradi*.

Fig. 8. Represents the number and position of the vertical rows of tubercles in *D. tuberosum*. All of the preceding forms are attenuate below.

Figs. 9–14. Represents three species having a spreading form, one of which has been proved to possess a transverse diaphragm.

Fig. 9. *Dictyophyton Redfieldi* has not yet been shown to possess the characteristic diaphragm.

Fig. 10. *Thamnodictya Newberryi*, preserving the general form of the cup and a portion of the pedicel.

Fig. 11. *Ibid.* The expanded portion of another specimen which is separated from the basal portion.

Fig. 12. *Phragmodictya catilliformis*, showing the form and ornamentation of the cup, the summit of the basal portion and margin attachment.

Fig. 13. *Ibid.* Reduced, showing the base and superior portion separated at the diaphragm.

Fig. 14. *Ibid.* A specimen preserving the circular septum and a double extension of the walls, the lower one being less distinctly reticulate. (Reduced from the large figure given by Mr. Whitfield. Bull. Am. Mus. Nat. Hist. p. 18, pl. 3, fig. 1, 1881.)

Fig. 1. *Cyathophycus reticulatus*, Walcott. Utica slate, N. Y.

Figs. 2, 2*a*. *Dictyophyton prismaticum*, Hall. Chemung group, N. Y. and Pa.

Figs. 3, 4, 4*a*. *Dictyophyton Conradi*, Hall. Chemung group, N. Y.

Fig. 5. *Dictyophyton annulatum*, Hall. Chemung group, N. Y.

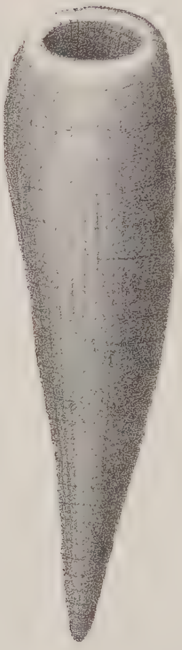
Fig. 6. *Dictyophyton nodosum*, Hall. Chemung group, N. Y.

Figs. 7, 8. *Dictyophyton tuberosum*, Conrad. Chemung group, N. Y.

Fig. 9. *Dictyophyton Redfieldi*, Hall. Waverly group, Ohio.

Figs. 10, 11. *Thamnodictya Newberryi*, Hall. Waverly group, Ohio.

Figs. 12, 13 and 14. *Phragmodictya catilliformis*, Whitfield. Keokuk group. Lower Carboniferous, Indiana.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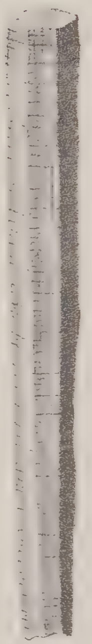
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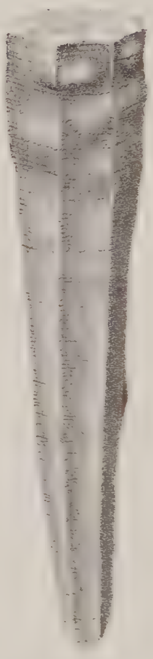
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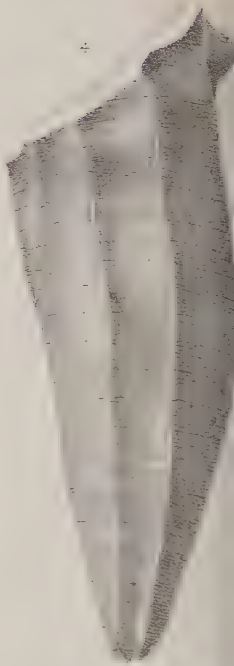
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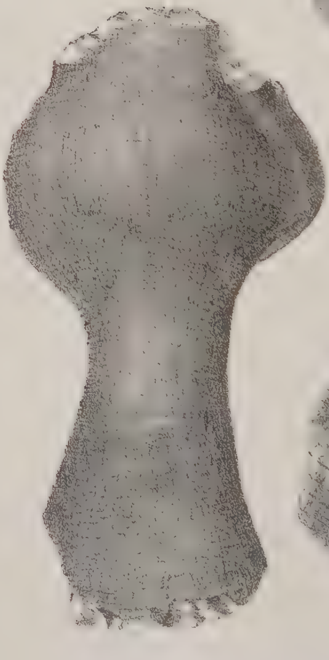
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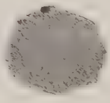
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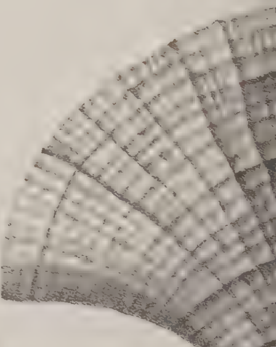

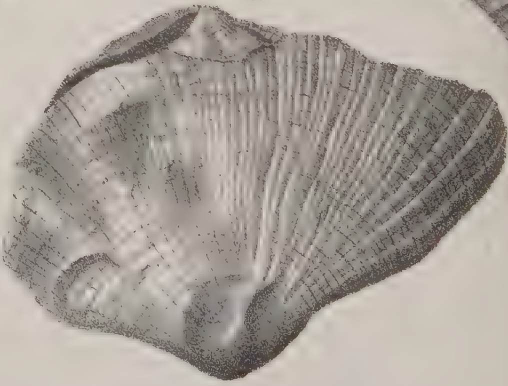
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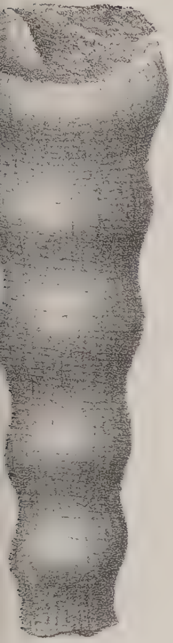

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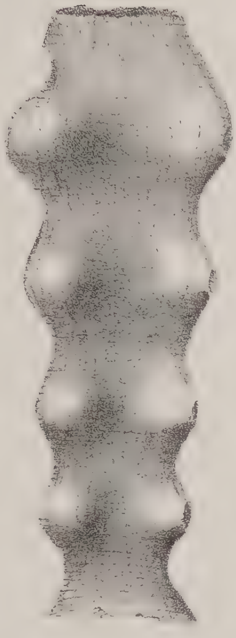

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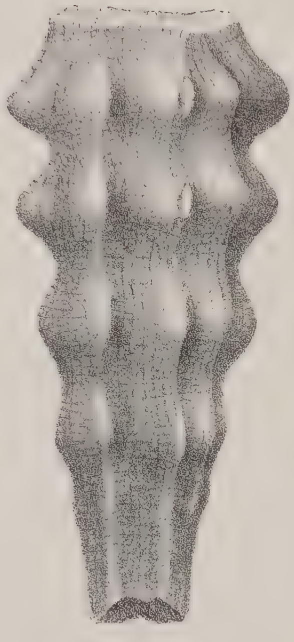

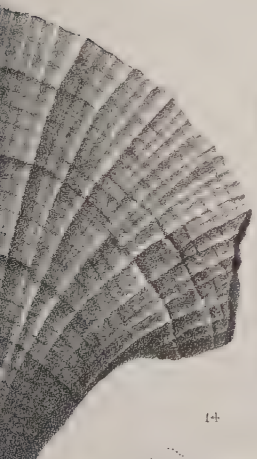

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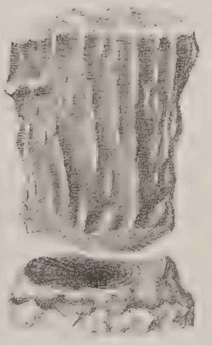

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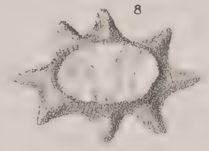

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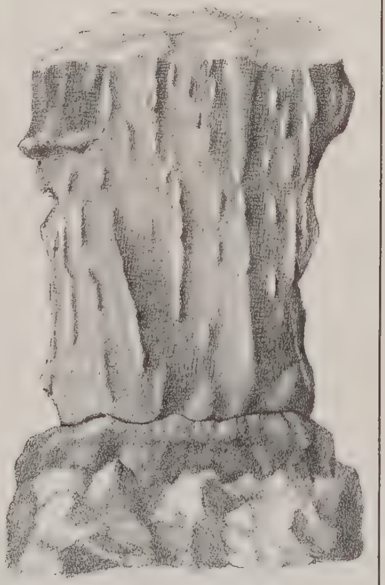

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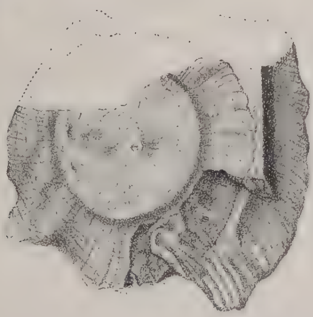

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PLATE XIX.

ECTENODICTYA IMPLEXA.

Page 475.

Fig. 1. Lateral view of a specimen showing the constrictions and large obscure bullæ. *Waverly group, Warren, Pa.*

DICTYOPHYTON (CLATHROSPONGIA) ABACUS.

Page 474.

Fig. 2. A specimen (found in the interior of the preceding), showing the conical form, the ridges bearing the concentric and radiating laminar expansions, and obscurely the finer reticulations. Two of the longitudinal alæ are represented as they are imbedded in the surrounding rock. Besides this species several fragments of another distinct form are represented on the right of the principal figure, which may belong to the inclosing frond of *E. implexus.*

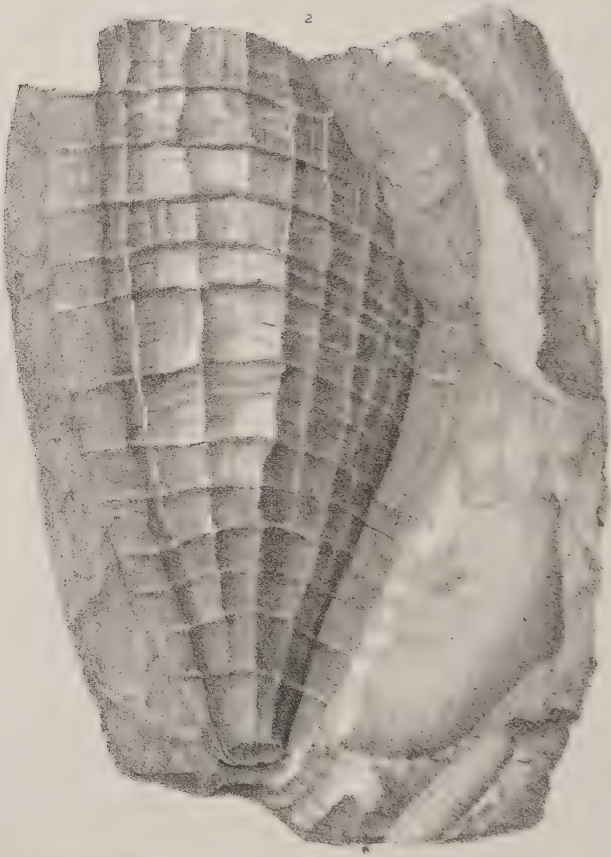
Fig. 3. A small fragment of a cone, showing more distinctly the alternating surface lines, and the reticulate character of the lamellate expansions.

Fig. 4. A partial restoration of a portion of fig. 2, to show the true character of the walls of the cone. The features here represented have all been distinctly observed in the specimens. *Waverly group, Warren, Pa.*

DICTYOPHYTON TENUE.

Page 474.

Fig. 5. A fragment showing two depressions or the impressions of two tubercles, and preserving very fine longitudinal and transverse striæ. *Waverly group, Warren, Pa.*



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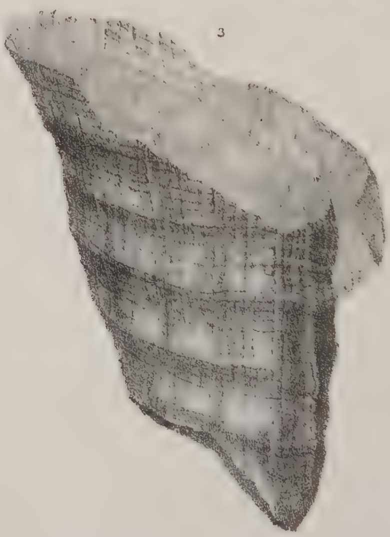

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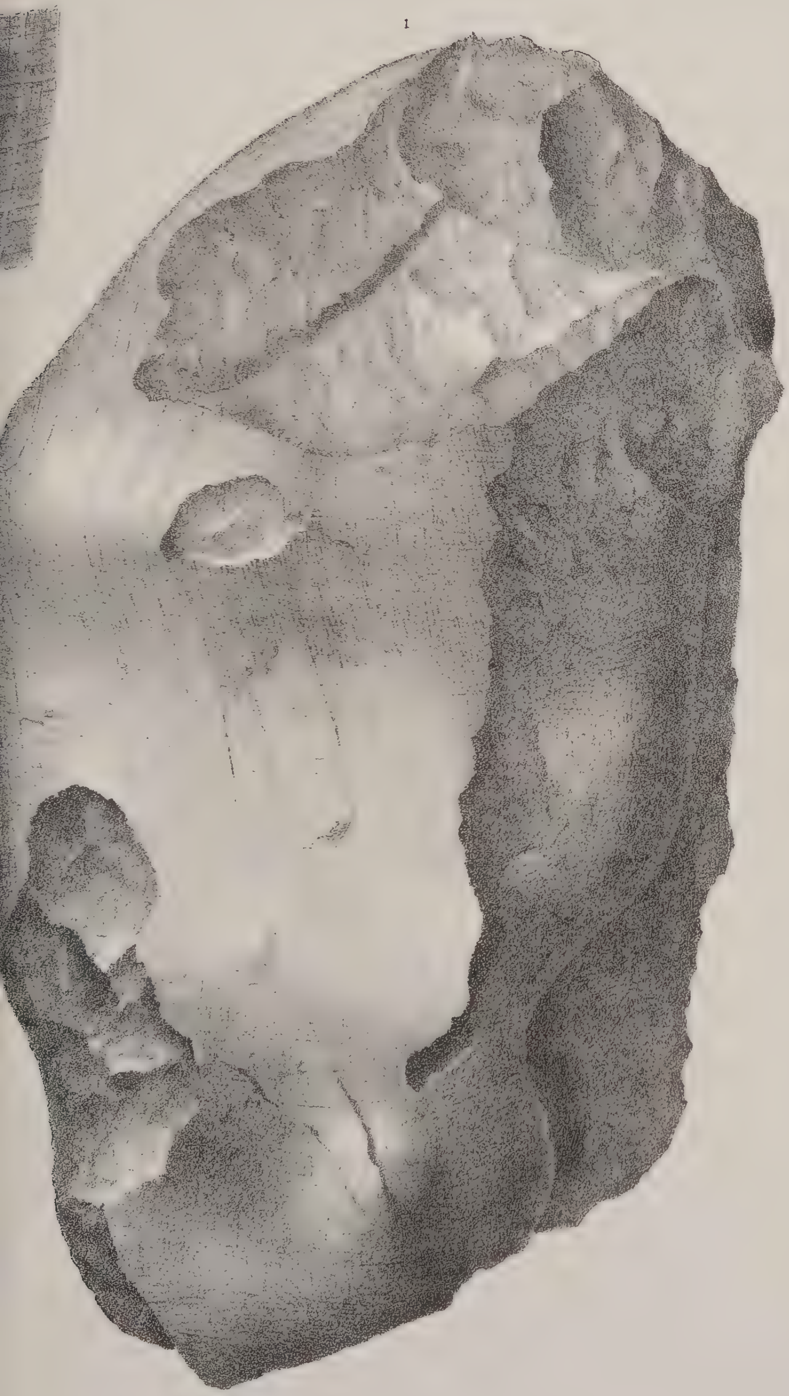

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PLATE XX.

ECTENODICTYA ECCENTRICA.

Page 476.

Fig. 1. A specimen obliquely compressed showing the concentric and radiating lines from the eccentric apex.
Keokuk group, Indiana.

PHRAGMODICTYA CATILLIFORMIS.

Page 477.

Figs. 2, 3. Lateral and vertical views of a small specimen, showing the diaphragm. *Keokuk group, Indiana.*

PHYSOSPONGIA DAWSONI, *Whitfield, sp.*

Page 479.

Fig. 4. Lateral view of an infundibuliform specimen showing some of the nodes extended into spiniform processes.

Fig. 5. A fragment showing the arrangement of the nodes and depressions. Some of the nodes are broken off, and a few of the depressions are filled with the surrounding rock.

Fig. 6. A small example of the same species.

Fig. 8. Two nodes and corresponding depressions enlarged to show their alternate arrangement, and the acicular spicules forming the substance of the envelope. *Keokuk group, Indiana.*

PHYSOSPONGIA COLLETTI.

Page 480.

Fig. 7. A portion taken from near the aperture of a large individual, showing the irregular arrangement and large size of the nodes.
Keokuk group, Indiana.

PHYSOSPONGIA ALTERNATA.

Page 481.

Fig. 9. A cylindrical fragment showing the broad alternating nodes and depressions, with narrow, concentric and longitudinal cinctures.
Keokuk group, Indiana.

ECTENODICTYA EXPANSA.

Page 475.

Fig. 10. A large fragment showing an obscure concentric and radiating arrangement of the surface lines, and several nodes and ridges upon a portion of the periphery.
Waverly group, Warren, Pa.

State Mus. Nat. Hist. 35.

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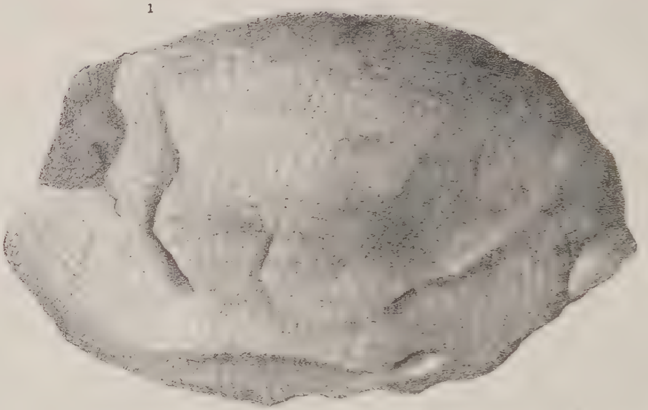

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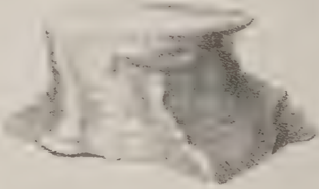

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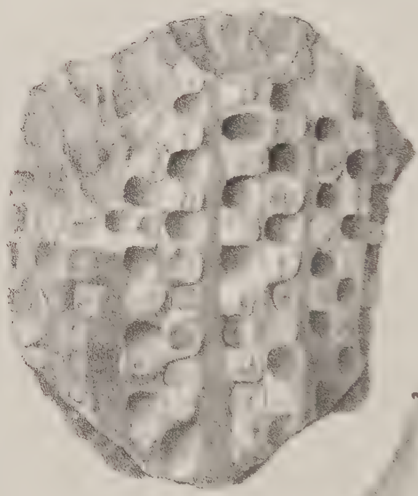

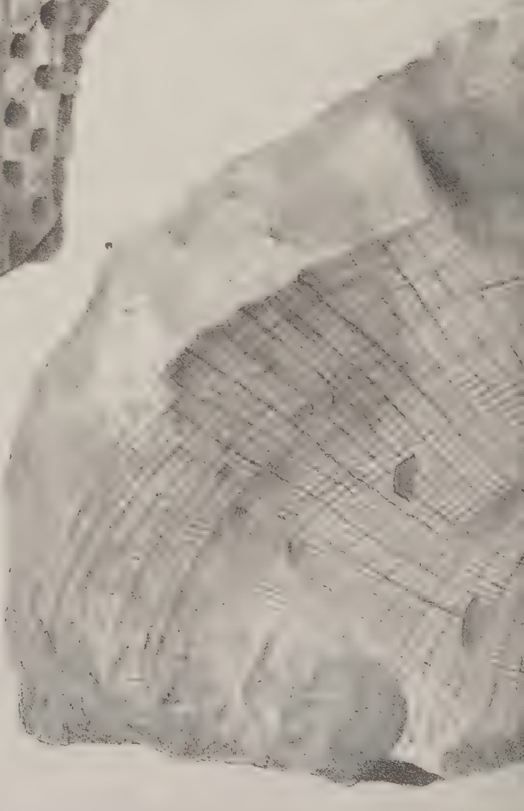

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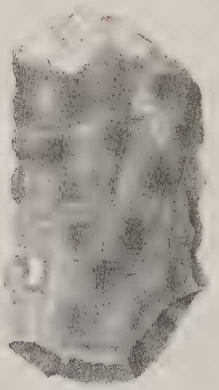

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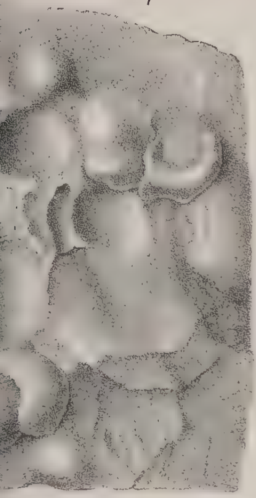

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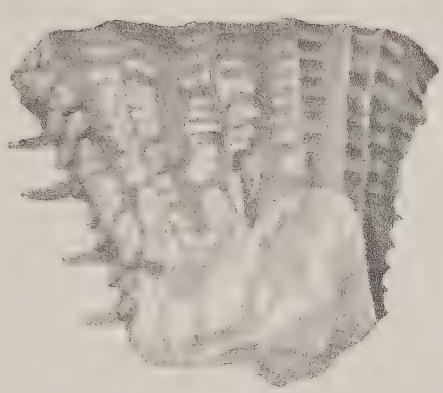

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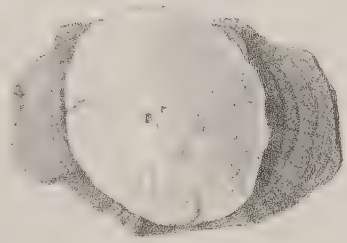

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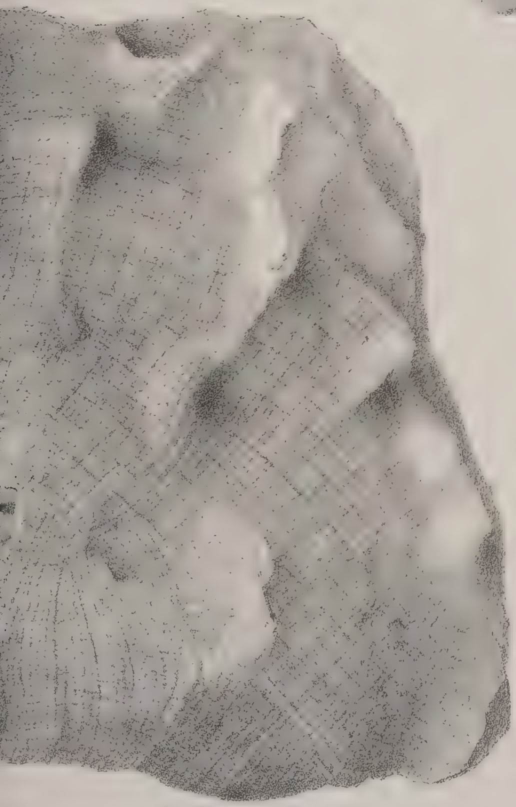

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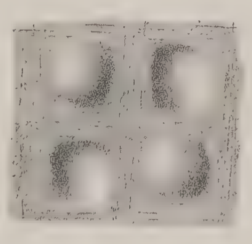

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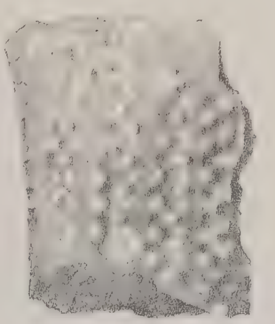

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PLATE XXI.

PHRAGMODICTYA CATILLIFORMIS.

Page 477.

Fig. 1. The cup of a cylindrical specimen showing the continuous longitudinal ridges and the septum at the base of the figure.

Fig. 2. The diaphragm of a similar specimen showing the fine concentric and radiating lines, with a portion of the outer envelope continued below.

Fig. 3. An expanded cup somewhat compressed, but preserving nearly the entire outline. The longitudinal ridges die out toward the margin of the cup.

Fig. 4. An enlargement of a portion of the upper margin of the cup (ng. 3), to show the crowding of the striæ producing a slight thickening of the rim, and the gradual obsolescence of the nodes.

The great expansion of the frond above (as represented in figure 3), the finely cancellate structure of the envelope, and the apparent completeness of the same along this extended margin in this and several other specimens, has led to the inference that this may be the upper extremity of the organism; while analogy with Euplectella would indicate the opposite end as the upper termination of the frond.

The writer has submitted a collection of specimens of this species to Prof. A. Hyatt, and a letter from him, discusing this question, will be given with the completed paper.

Fig. 5. A small cup with the septum apparently perforate.

Fig. 6. A very elongate cylindrical specimen preserving the diaphragm.

Keokuk group, Indiana.

PHRAGMODICTYA (?) CREBRISTRIATA.

Page 000.

Fig. 7. Lateral view of a fragment having a curved outline and showing the fine reticulation of the surface. The specimen is too imperfect for satisfactory determination. *Keokuk group, Indiana.*

PHRAGMODICTYA LINEATA.

Page 478.

Fig. 8. Lateral view of a compressed specimen showing the strong regular reticulate striæ without ornamentation of nodes or ridges, and the septum at the base with an abrupt depression at the apical scar.

Keokuk group, Indiana.

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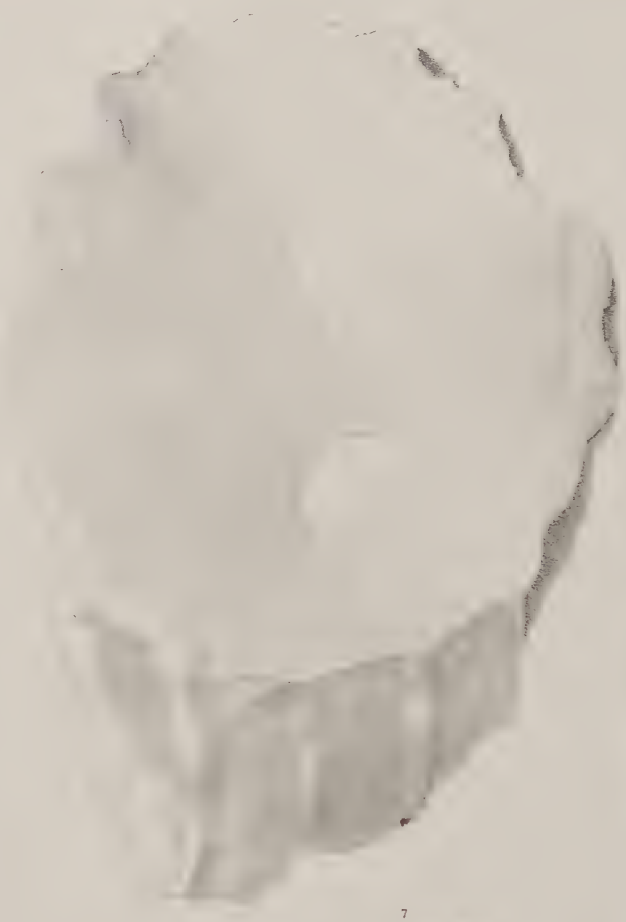

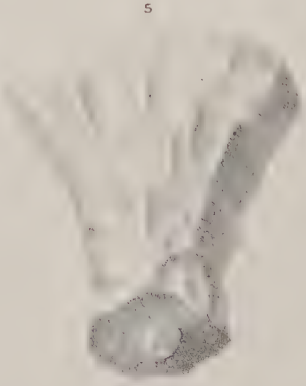

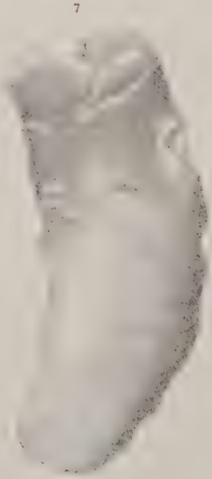

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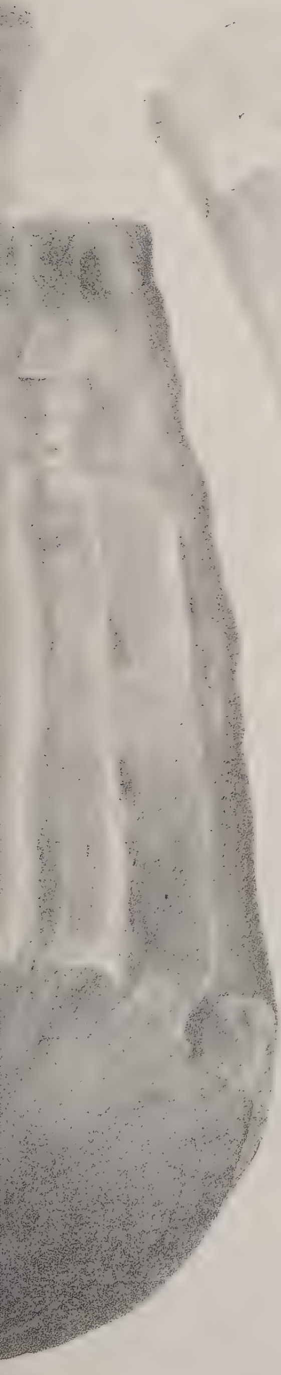

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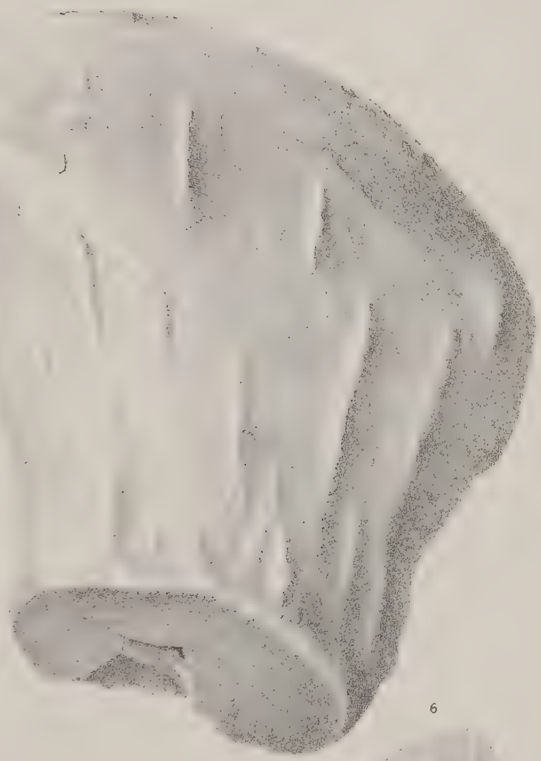

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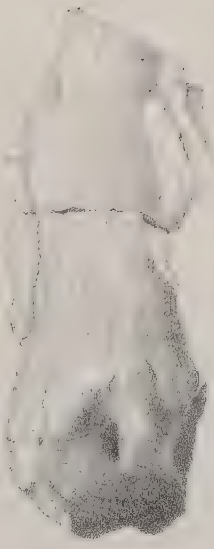

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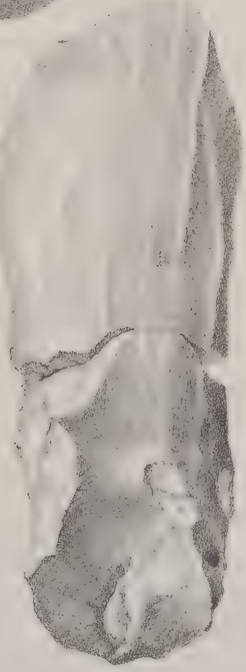

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PLATE XXII.

The accompanying illustrations are presented to show the principal varieties of structure of the Strophomenoid Brachiopoda. They represent a portion of the work which is being done for the elucidation of shell structure preparatory for the volume of the Palæontology on the Revision of the Brachiopoda. The specimens are prepared and photographed and the accompanying figures were drawn on stone from photographic prints.

Fig. 1. *Strophomena rhomboidalis*, showing the simple rows of large punctæ.
Hudson River group, Ohio.

Fig. 2. *Strophomena alternata.* showing sparse and irregular punctæ.
Hudson River group, Ohio.

Fig. 3. *Leptaena sericea*, showing the oblique tubuli of the shell.
Hudson River group, Tenn.

Fig. 4. *Strophodonta magnifica.* This species shows numerous large punctæ and the concentration of the laminæ of the shell around the tubuli. *Oriskany Sandstone, Canada West.*

Fig. 5. *Strophodonta demissa.* The upper part of the figure shows the irregular arrangement of the punctæ at some distance below the surface. On the lower portion of the figure, where the section is cut nearer the surface, the punctæ are arranged in rows corresponding to the radii of the ornamentation of the shell. These features are due to the curvature of the shell which makes the section cut at different depths below the surface.
Hamilton group, N. Y.

Fig. 6. *Strophodonta perplana*, showing the arrangement of the punctæ in nearly regular lines. *Hamilton group, N. Y.*

Fig. 7. *Strophodonta reversa.* This figure shows very distinctly the curving and crowding of the fibers and laminæ around the tubuli making them appear like small tubercles.
Chemung group, Iowa.

Fig. 8. *Chonetes coronata.* The section is cut just below the surface and shows the single row of large punctæ coming out along the summits of the costæ. The rows of fine crenulations are produced by the laminæ forming the sharp concentric striæ of the surface.
Hamilton group, N. Y.

Fig. 9. *Tropidoleptus carinatus.* Section of the shell of the width of two costæ, showing the numerous oblique rows of punctæ which are more crowded along the summits of the ribs.
Hamilton group, N. Y.

All the figures represent an enlargement of twenty diameters.

ILLUSTRATIONS OF THE

MICROSCOPIC STRUCTURE OF BRACHIOPODA.

ate Mus.Nat.Hist.35. Plate 22

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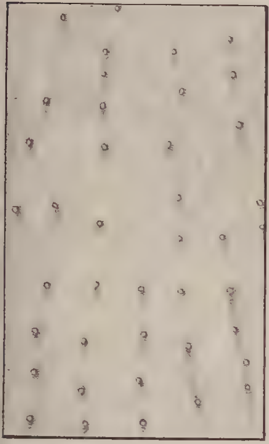

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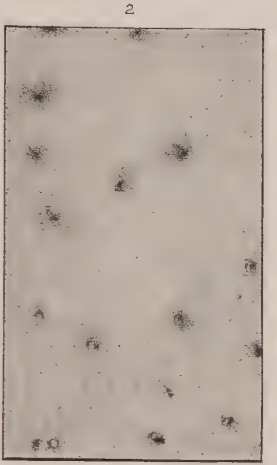

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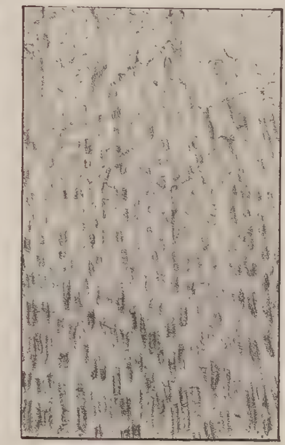

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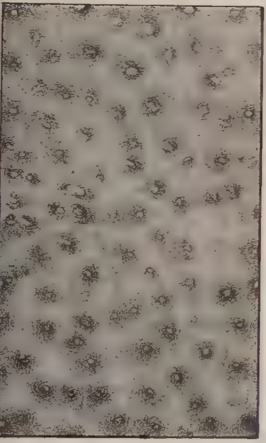

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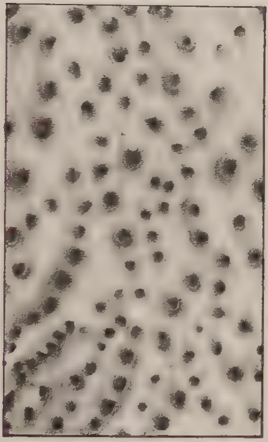

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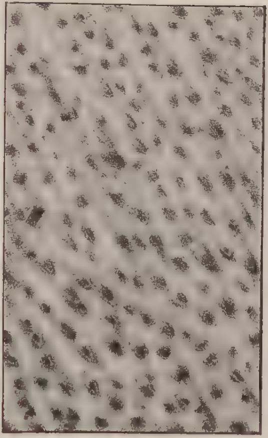

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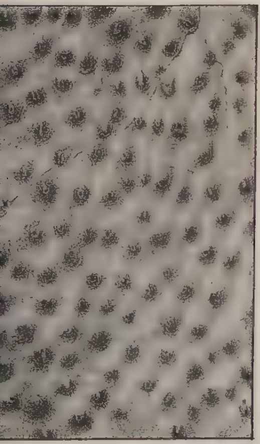

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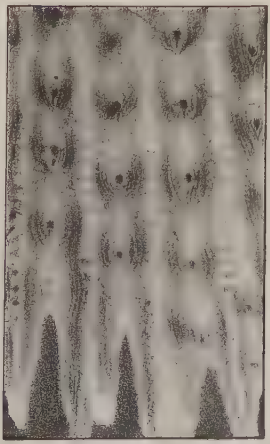

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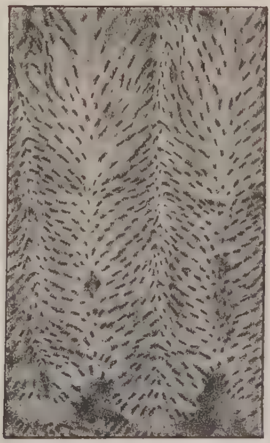

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PLATE XXIII.

Streptelasma lamellatum.

Page 421.

Fig. 1. Posterior view of a specimen showing the interior of the calyx.

Streptelasma tenue.

Page 421.

Fig. 2. Lateral view of a specimen.

Streptelasma dissimile.

Page 421.

Fig. 3. Posterior view.
Fig. 4. Similar to the preceding but inclined to show the cup.
Fig. 5. Lateral view of a specimen preserving the surface characters.

Streptelasma inflatum.

Page 422.

Fig. 6. Lateral view of a specimen of the ordinary proportions.
Fig. 7. The calical view of the preceding.

Streptelasma simplex.

Page 422.

Fig. 8. Lateral view of a specimen.
Fig. 9. Posterior view of the same showing the cup.

Streptelasma laterarium.

Page 422.

Fig. 10. Lateral view of a corallum.
Fig. 11. Posterior view of the same.
Fig 12. Lateral view of another specimen.

FOSSIL CORALS.

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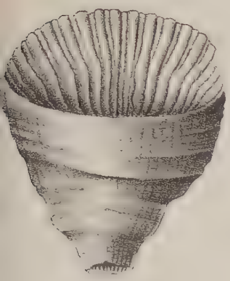

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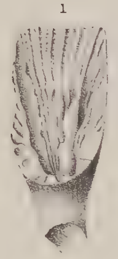

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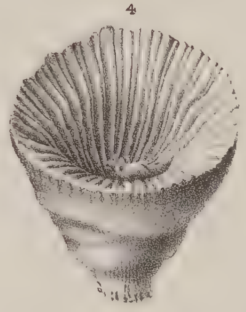

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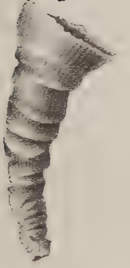

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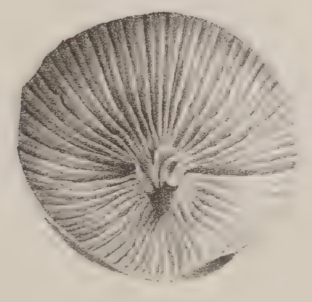

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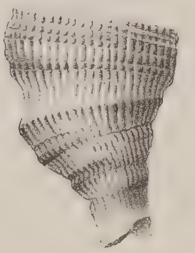

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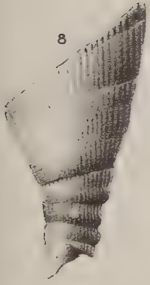

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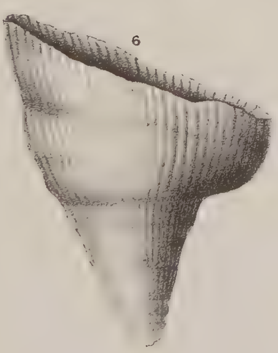

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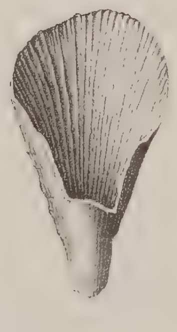

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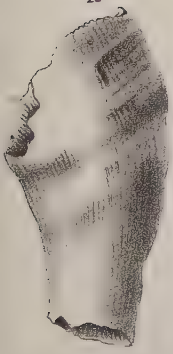

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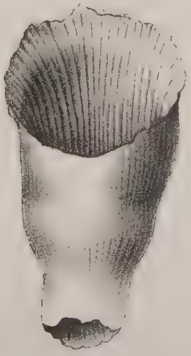

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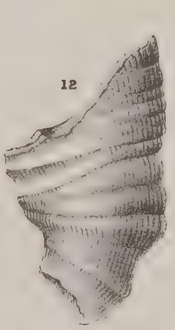

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PLATE XXIV.

STREPTELASMA AMPLIATUM.

Page 423.

Fig. 1. Posterior view of a specimen.
Fig. 2. View of the calyx.
Fig. 3. The elevation in the center of the cup of the preceding.

STREPTELASMA CONSPICUUM.

Page 423.

Fig. 4. Posterior view of the specimen showing the calyx.

STREPTELASMA FOSSULA.

Page 423.

Fig. 5. Posterior view of the specimen.

STREPTELASMA CRATERIFORME.

Page 424.

Fig. 6. Posterior side of the specimen.
Fig. 7. The calyx of the preceding.

STREPTELASMA INVOLUTUM.

Page 424.

Fig. 8. Lateral view of a specimen.
Fig. 9. The calyx of the same.

STREPTELASMA ÆQUIDISTANS.

Page 424.

Fig. 10. Side view of the specimen.
Fig. 11. The form of the calyx.

STREPTELASMA MAMMIFERUM.

Page 425.

Fig. 12. Specimen nearly entire, preserving the conical elevation in the center.
Fig. 13. Lateral view of a broken specimen showing the interior of the cup and the twisted lamellæ in the center.

STREPTELASMA PAPILLATUM.

Page 425.

Fig. 14. Posterior view showing the calyx.
Fig. 15. Lateral view of another individual.

STREPTELASMA COARCTATUM.

Page 425.

Figs. 16, 17. Lateral and posterior views of a specimen; the latter showing the interior of the calyx with the twisted lamellæ.

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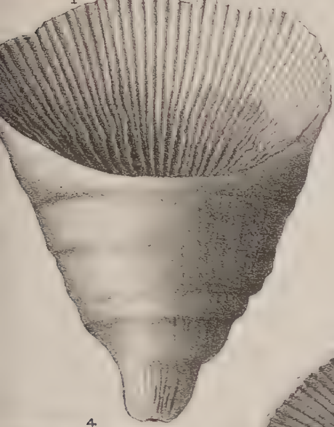

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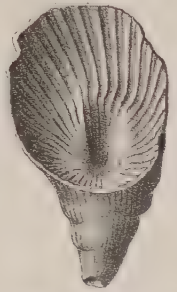

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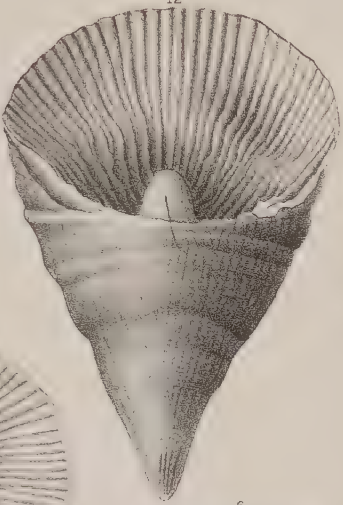

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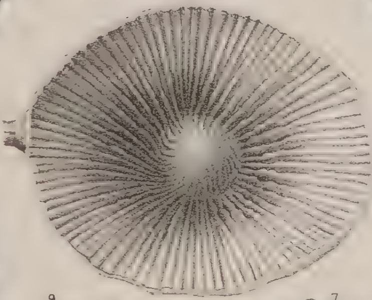

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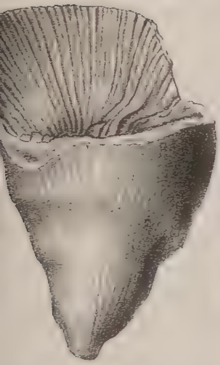

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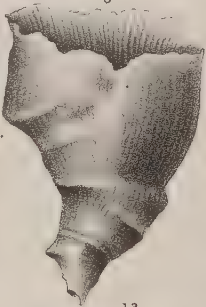

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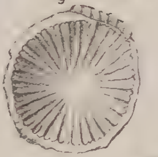

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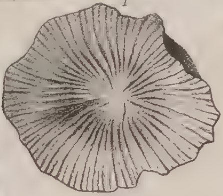

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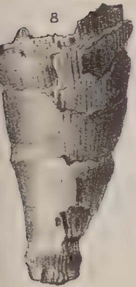

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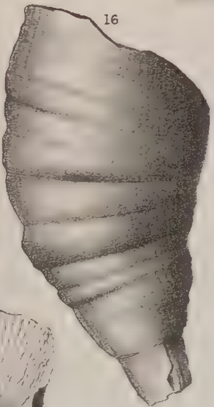

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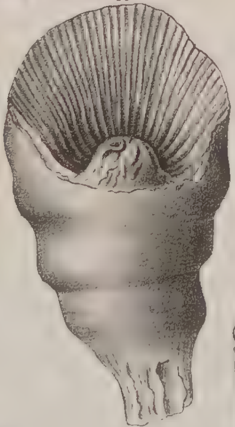

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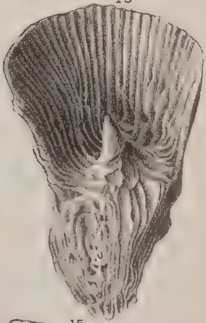

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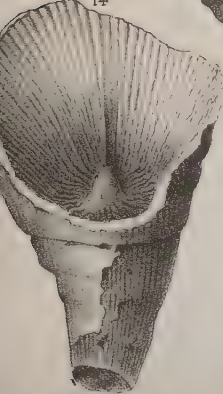

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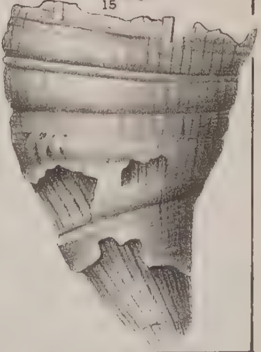

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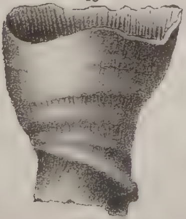

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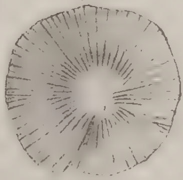

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PLATE XXV.

PTYCHOPHYLLUM VERSIFORME.*

Page 426.

Fig. 1. Lateral view of an elongate and irregular growing individual.
Fig. 2. Lateral view of a short and broad specimen.
Fig. 3. A calyx showing the strong, coarse rays.
Fig. 4. A calyx where the rays are partially obliterated by silicification.

PTYCHOPHYLLUM STRIATUM.

Page 426.

Fig. 5. Lateral view of a specimen.
Fig. 6. Posterior view of another individual.
Fig. 7. The calyx of the preceding.
Fig. 8. Side view of the wall of the cup, enlarged to two diameters.

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* This specific name is retained for the present. It does not seem advisable to make the separation and distinction as given in the Twelfth Indiana Report for Ptychophyllum Knappi.

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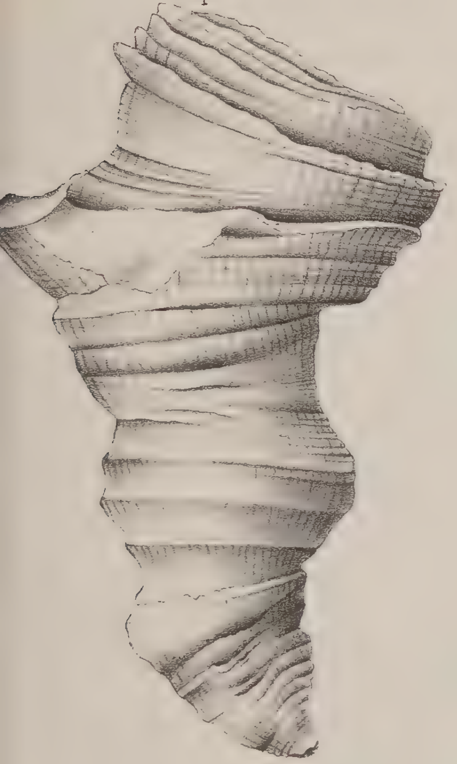

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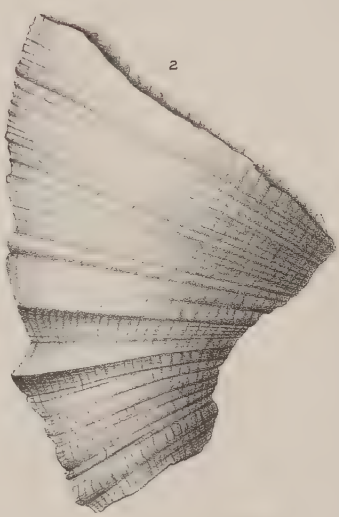

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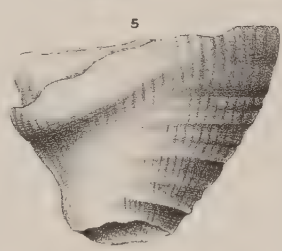

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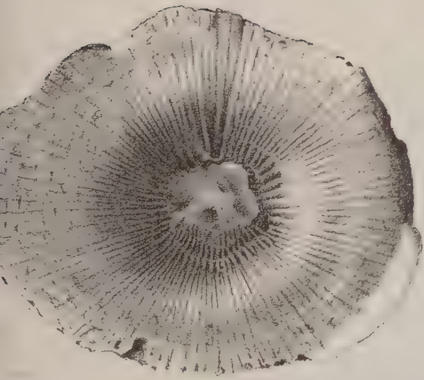

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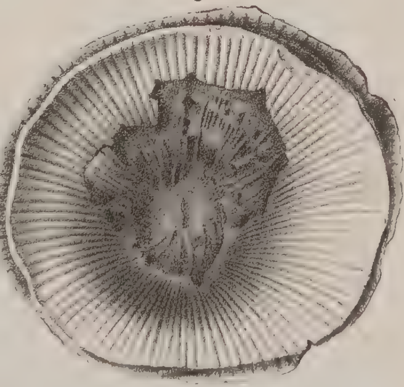

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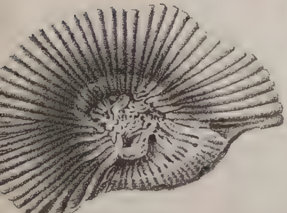

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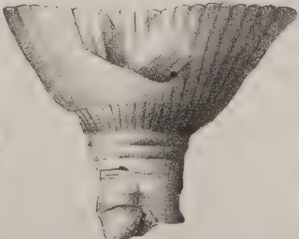

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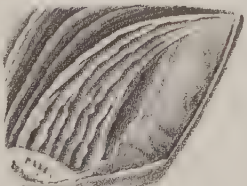

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PLATE XXVI.

AULACOPHYLLUM SULCATUM, *D'Orbigny*.

Fig. 1. Posterior view of a decorticated specimen.
Fig. 2. Lateral view of the same.
Fig. 3. Posterior view of a similar specimen, showing some variation in the disposition of the lamellæ.
Fig. 4. Posterior view of a worn specimen showing the calyx.

AULACOPHYLLUM CRUCIFORME.

Page 428.

Fig. 5. Posterior view, showing the calyx.
Fig. 6. Lateral view of the coral.

AULACOPHYLLUM TRISULCATUM.

Page 429.

Fig. 7. Lateral view of the specimen.
Fig. 8. View of the calyx.

AULACOPHYLLUM CONVERGENS.

Page 426.

Fig. 9. Lateral view of the coral.
Fig. 10. View of the calyx.

FOSSIL CORALS.

Plate 26.

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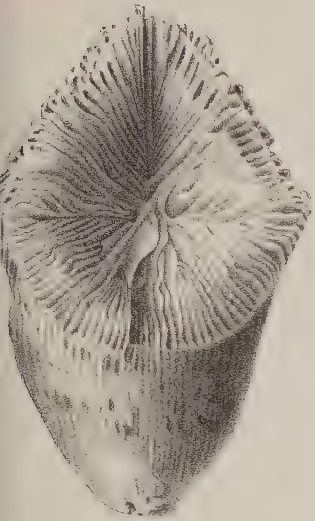

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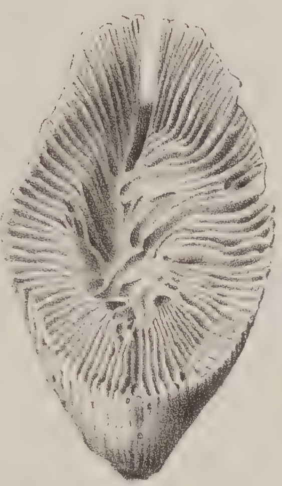

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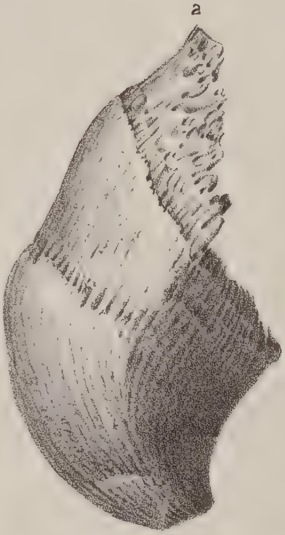

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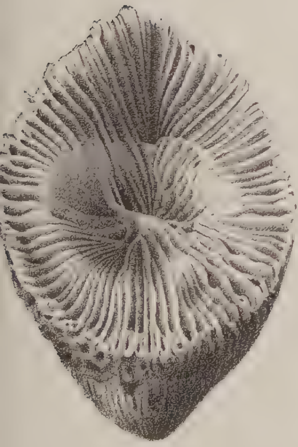

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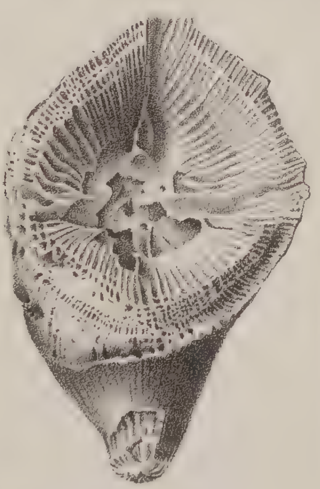

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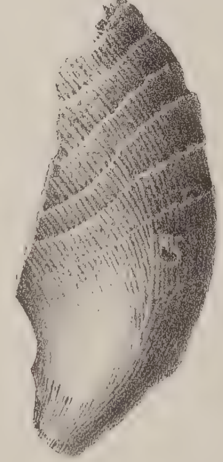

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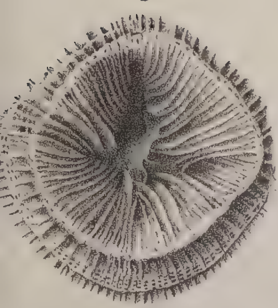

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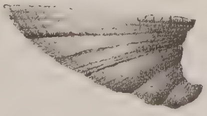

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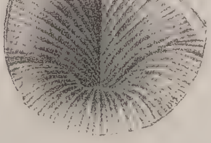

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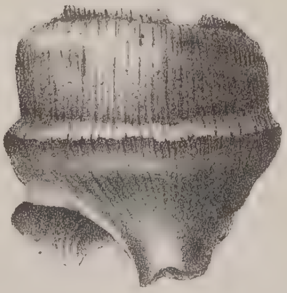

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PLATE XXVII.

AULACOPHYLLUM PRINCEPS.

Page 427.

Fig. 1. View from the posterior side, showing the interior of the calyx and lamellæ.
Fig. 2. Anterior side of the same individual.

AULACOPHYLLUM REFLEXUM.

Page 428.

Fig. 3. Lateral view of a specimen.
Fig. 4. The calyx of the same enlarged to two diameters.

AULACOPHYLLUM BILATERALE.

Page 429.

Fig. 5. Posterior view of the specimen.

AULACOPHYLLUM PRATERIFORME.

Page 427.

Fig. 6. Lateral view of an imperfect specimen.
Fig. 7. View of the calyx.

AULACOPHYLLUM PRÆCIPTUM.

Page 428.

Fig. 8. Lateral view of the coral.

AULACOPHYLLUM PINNATUM.

Page 427.

Fig. 9. Lateral view of an imperfect specimen.
Fig. 10. View of a specimen showing the cup.

AULACOPHYLLUM TRIPINNATUM.

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Fig. 11. View of a specimen imperfect at the base.
Fig. 12. Calyx of the same.

AULACOPHYLLUM POCULUM.

Page 429.

Fig. 13. Lateral view of the upper portion of a specimen.
Fig. 14. View of the calyx of the preceding.
Fig. 15. The calyx of another specimen.

FOSSIL CORALS.

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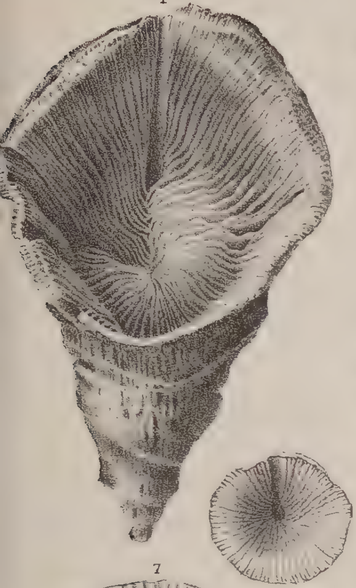

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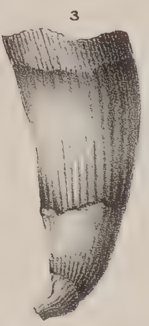

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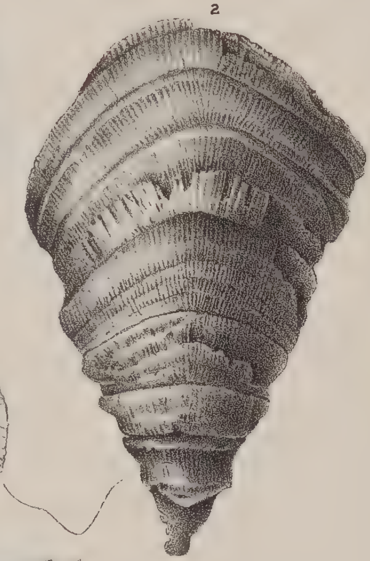

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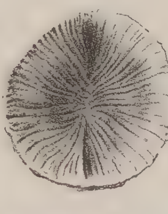

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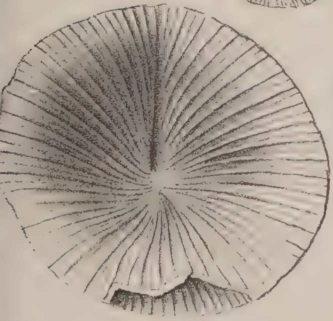

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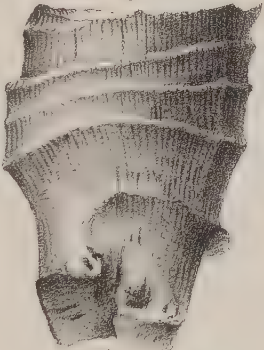

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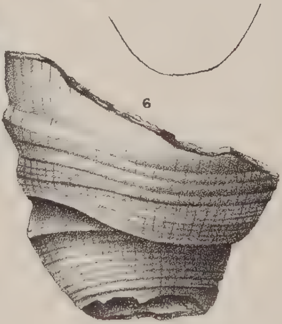

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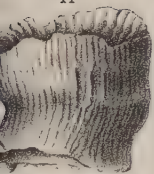

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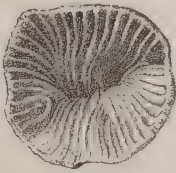

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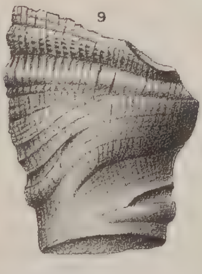

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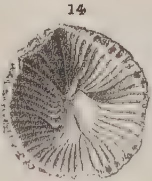

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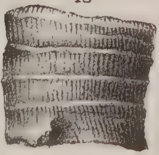

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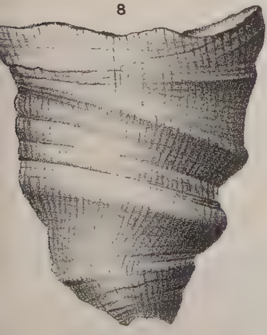

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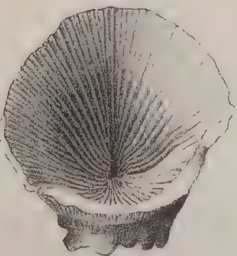

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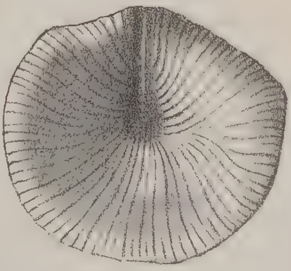

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PLATE XXVIII.

ZAPHRENTIS COMPLANATA.

Page 430.

Fig. 1. Posterior view of the specimen, showing the interior of the calyx.

ZAPHRENTIS CYATHIFORMIS.

Page 431.

Fig. 2. Lateral view of a specimen.
Fig. 3. Calicular view of the same.

ZAPHRENTIS PONDEROSA.

Page 431.

Fig. 4. A posterior view, looking into the calyx. The specimen is slightly twisted in its mode of growth.

ZAPHRENTIS CORRUGATA.

Page 431.

Fig. 5. Lateral view of a specimen.
Fig. 6. View of a fragment, showing the interior of the cup.

ZAPHRENTIS SUBCOMPRESSA.

Page 432.

Fig. 7. Lateral view of a specimen.
Fig. 8. The calyx of another specimen.

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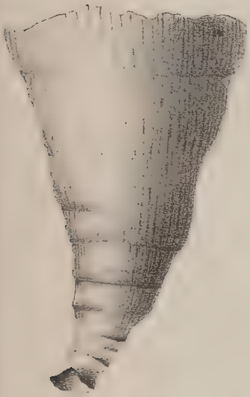

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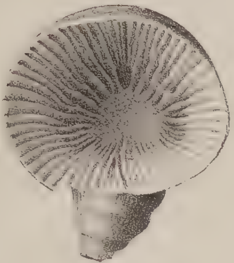

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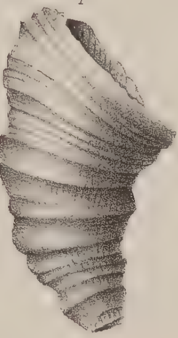

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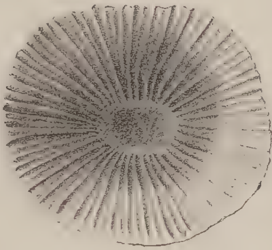

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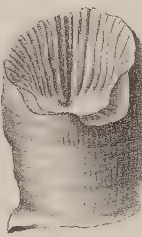

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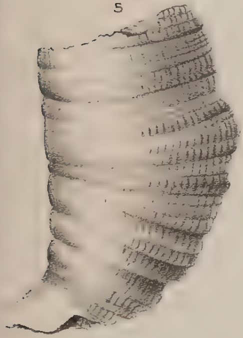

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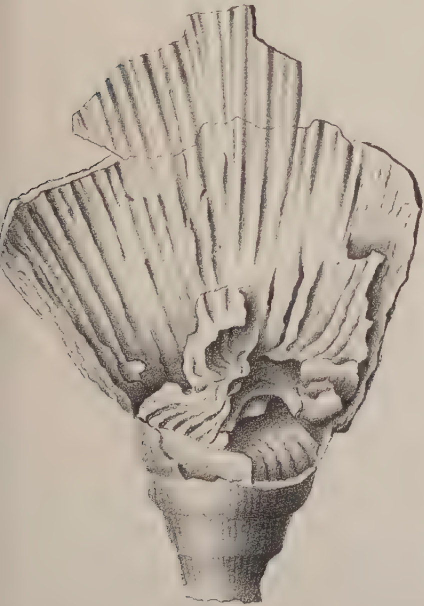

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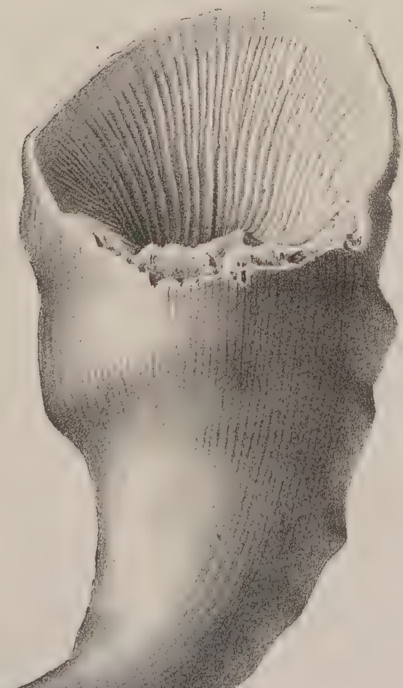

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PLATE XXIX.

ZAPHRENTIS FUSIFORMIS.

Page 433.

Fig. 1. Lateral view.
Fig. 2. The calyx of the same.

ZAPHRENTIS TABULATA.

Page 431.

Fig. 3. Lateral view of a fragment.
Fig. 4. A natural section, showing the characters of the interior.

ZAPHRENTIS COLLETTI.

Page 432.

Fig. 5. Lateral view of a specimen of this species.
Fig. 6. View of the calyx, showing the strong lamellæ.

ZAPHRENTIS PLANIMA.

Page 433.

Fig. 7. Lateral view of the coral.
Fig. 8. View of the calyx.

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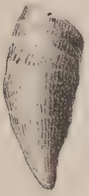
Plate 29.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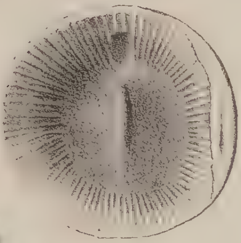
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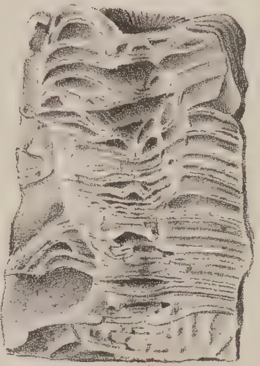
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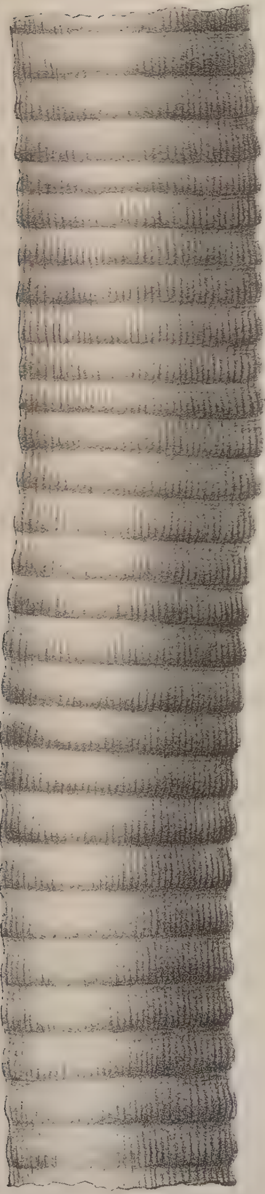
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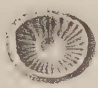
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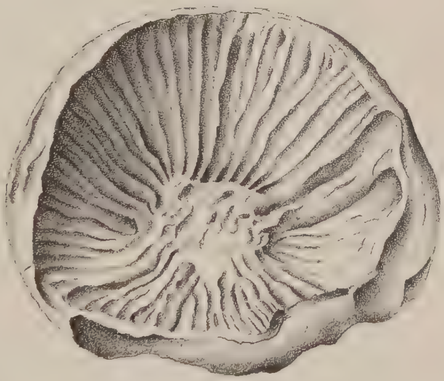
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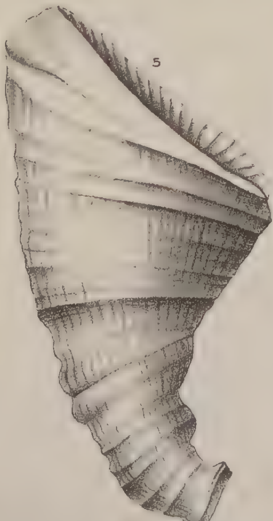
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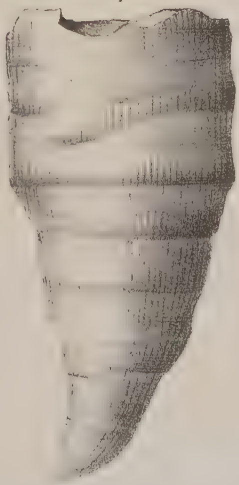
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PLATE XXX.

Zaphrentis compressa, *Rominger*.

Figs. 1, 2, 3. Lateral, posterior and calicular views of a large and perfect specimen.

Zaphrentis ungula, *Rominger*.

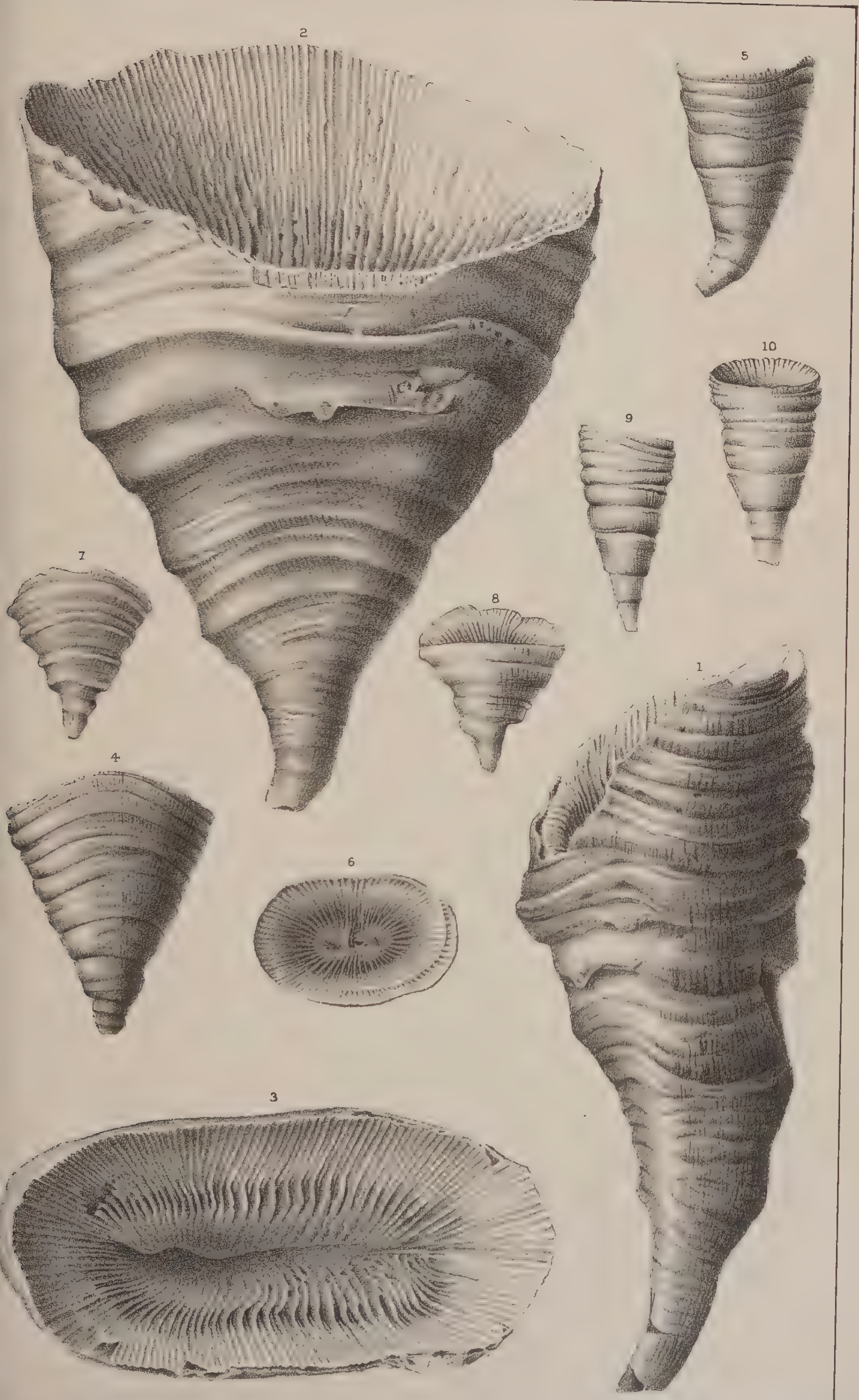
Figs. 4, 5, 6. Anterior, lateral and calicular views of a specimen somewhat larger than usual.

Figs. 7, 8. Anterior and posterior views of a specimen of the ordinary size.

Zaphrentis herzeri.

Page 439.

Figs. 9, 10. Lateral and posterior views of a specimen of this species.



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